NAVY CIVIL ENGINEER

SPRING 1981

Preparing the *Trident* Missile Submarine Base — Kings Bay, Ga.

Basic CEC Officers Class No. 158

Graduated 6 March 1981

29 enter Civil Engineer Corps

. . . following their graduation from the Naval School, Civil Engineer Corps Officers, on 6 March 1981. Speaker at the ceremonies was Rear Admiral Philip V. King, CEC, USNR (Ret.), who also presented diplomas with assistance by Capt. Fred G. Kelley, CEC, USN, commanding officer of CECOS. Honor graduate was LTJG Mark E. Samuels, CEC, USN, whose photograph is indicated by ★. Those class members graduating with distinction are indicated by •.

★ **LTJG Mark B. Samuels**
BS Ocean Eng./USNA
to Jacksonville, Fla.

ENS. Jeffrey S. Babb
BSME/Georgia Tech.
to Portsmouth, N.H.

ENS Daniel F. Backman
BSCE/U. of Wash
to SanDiego, Calif.

ENS Paul Bosco
BSEE/The Citadel
to South Weymouth, Mass.

LTJG Douglas D. Carvel
BSCE/Lehigh Univ.
to Gulfport, Miss.

ENS Charles E. Cassidy
BSCE/Auburn Univ.
to Jacksonville, Fla.

LTJG Arthur N. Cole
BS Arch. Eng./U. of Colo.
to Pearl Harbor, Hawaii

ENS Gerald W. Crabbe
BSCE/San Diego State
to Port Hueneme, Calif.

LT Timothy Equels
BS Const. Eng./U. of Fla.
to Pensacola, Fla.

ENS Curtis M. Estes
M Arch./U. of Va.
to Panama Canal

ENS Allan M. Finley
BSCE/UC Berkeley
to Orlando, Fla.

• **CWO2 James A. Halfkenny**
AS/U. of New York
to Adak, Alaska

LTJG Ralph E. Hayden
BSCE/U. of Florida
to Pensacola, Fla.

ENS James D. Heerwagen
BSME/Duke Univ.
to Washington, D.C.

ENS Donald O. Hoodenpyle
BSEE/U. of Tenn.
to Adak, Alaska

• **ENS Charles C. Jackson**
BSCE/U. of Va.
to Oceanside, Calif.

ENS Steven K. Johnston
B Arch./U. of Ariz.
to Pearl Harbor, Hawaii

ENS Gordon W. Jones, Jr.
BSCE/U. of Fla.
to Patuxent River, MD.

LT Thomas D. Jones
BEEE/Vanderbilt U.
to Norfolk, Va.

ENS Hyuntae Kim
BSCE/U. of Wash.
to Guam, M.I.

LTJG Richard P. Komosky
BSCE/Univ. of Mass.
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to Mayport, Fla.

ENS Jeffrey D. Schuelke
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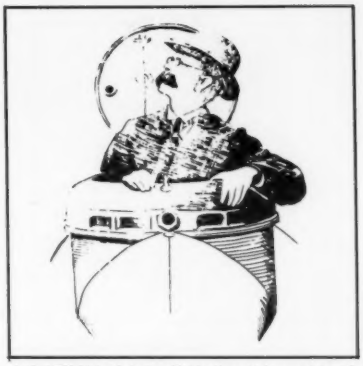
NAMED FOR the historical Navy hero, Rear Admiral John Paul Jones, Jr., CEC, USN is also named Vice-Commander, NAVFAC and Deputy Chief of Civil Engineers. A brief biography of Admiral Jones appears on page 17.



A SKETCH of John P. Holland, inventor of the Navy's first commissioned submarine, peers skyward from his underseas craft. And skyward is the course of the Trident missile to be launched from a new series of submarines (see covers). The preparation of the Georgia coast to receive these vessels is told on page 3.

HOMEMADE but effective devices are included in Public Works Technical Notes found on page 19. Readers are invited to submit similar devices or methods that have proven themselves in field usage.

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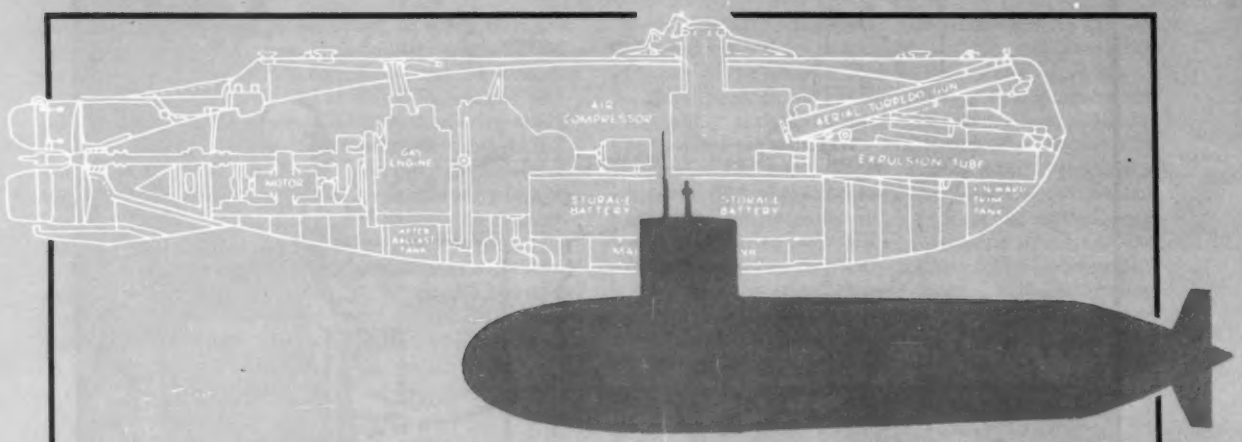
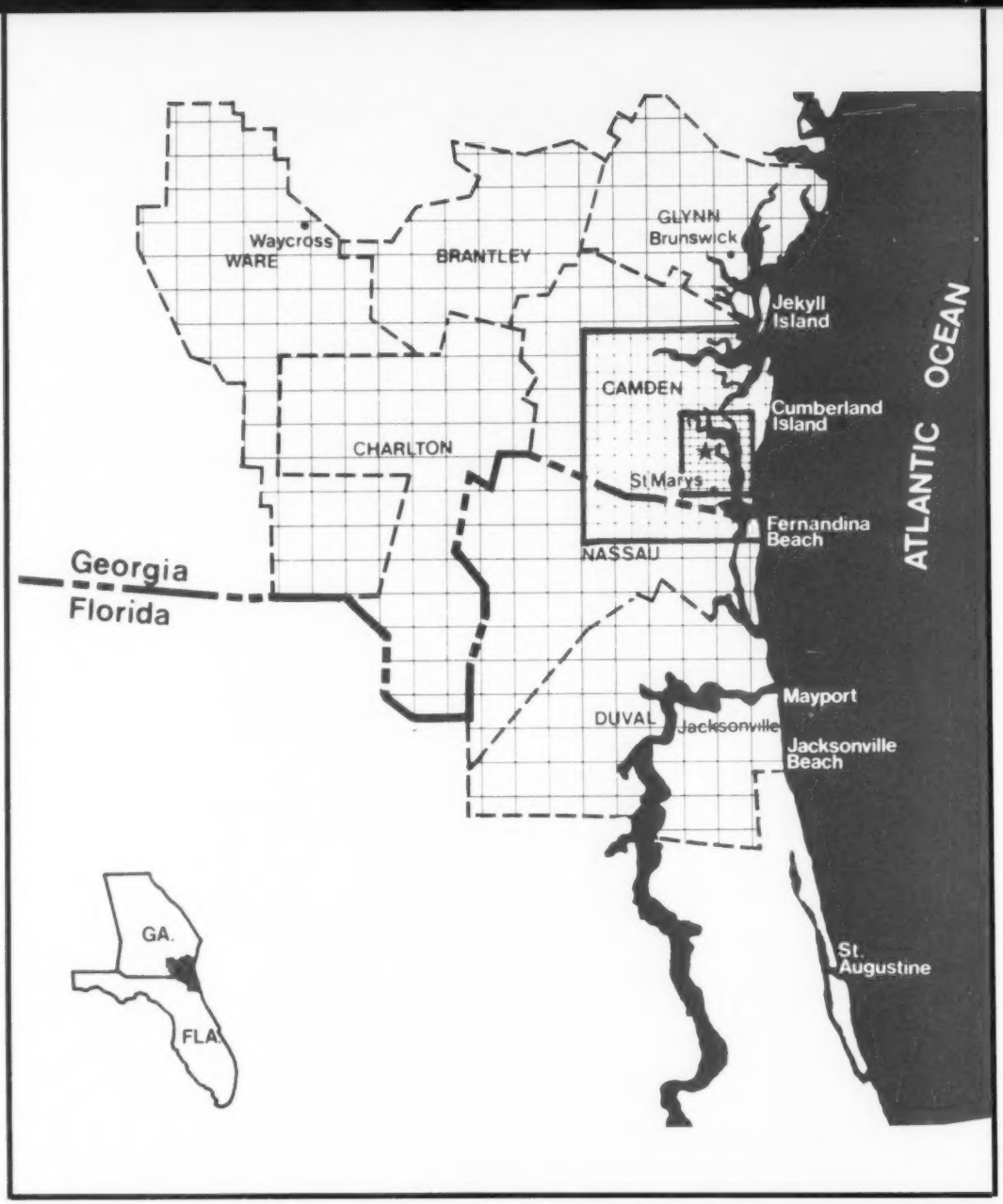


Atlantic Coast
TRIDENT
Submarine Base

Eighty-one years ago in October the U.S. Navy commissioned its first submarine, ***Holland,*** *which had been purchased from its designer, John P. Holland. The ghost image of the inventor is portrayed at right viewing upward the ghost cutaway of the original craft. Superimposed upon the image is a silhouette of the Navy's* ***Trident*** *class submarine. The giant undersea craft is 560 feet in length and displaces about 18,000 tons (see rear cover). Armed with 24* ***Trident*** *missiles (see front cover), whose range is over 4,000 miles, the super submarine will be homeported at Bangor, Washington, and Kings Bay, Georgia. Primary construction of the Northwestern Base has been concluded. The preparation and planning by the Naval Facilities Engineering command for the Southeastern base are told in the following pages.*



• Kings Bay, Ga.

Last fall, the Secretary of the Navy announced that Kings Bay, Ga. had been selected as the location for the construction of the Trident Atlantic Coast strategic submarine base.

The announcement culminates several years of detailed studies and analysis of many different East Coast base locations and configurations. The analysis considered operational capabilities and costs, environmental and social impacts, and social/economic impacts related to community growth.

The final supplement Environmental Impact Statement, (EIS), was filed with the U.S. Environmental Protection Agency on 11 September 1980. The selection of Kings Bay was made after full consideration of the impacts, as required by the National Environmental Policy Act and its implementing regulations.

The East Coast Trident Base will functionally duplicate the submarine base nearing completion at Bangor, Wash. Kings Bay will be constructed to support one squadron of Trident submarines and will include facilities for crew training, weapons handling and storage, submarine maintenance and repair, personnel support and family housing. A $1.6 billion military construction program, the Navy's largest peace-time construction effort, is currently planned to cover nine years beginning on 1 October 1981 (Fiscal Year 1982).

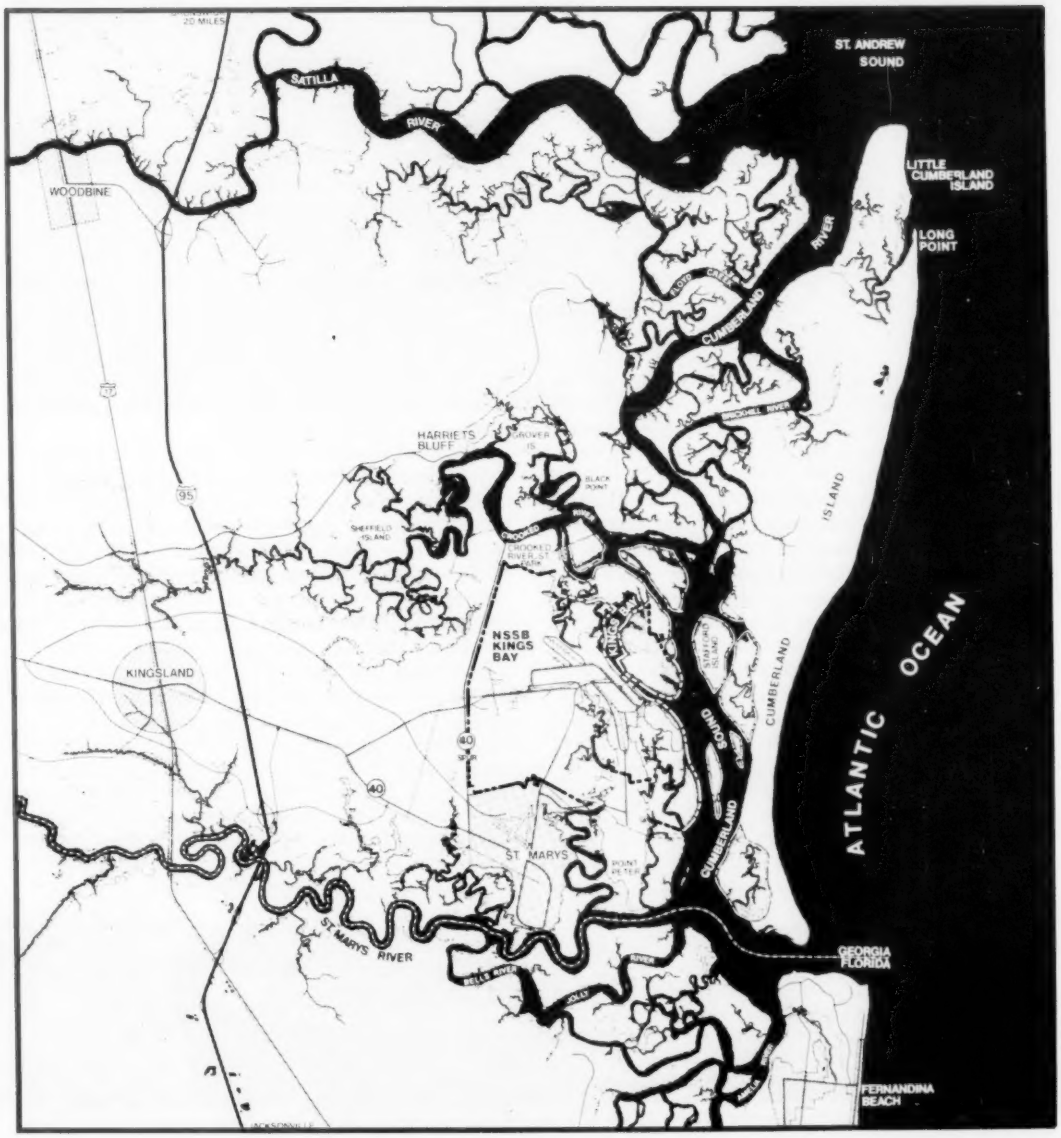
Providing support for Atlantic Fleet submarines is not new to Kings Bay, however. Negotiations with the government of Spain resulted in the relocation of Submarine

Squadron Sixteen from Rota, Spain, to Kings Bay on 2 July 1979. This squadron of fleet ballistic missile (FBM) submarines, currently being retrofitted with the *Trident-I* missile, is fully operational at Naval Submarine Support Base, Kings Bay, supported by the submarine tender U.S.S. *Simon Lake* and the floating drydock U.S.S. *Oakridge*. The military construction program for the relocation of the Rota squadron covered four program years beginning in FY-78 and will amount to approximately $125 million.

The most significant item in the relocation was the acquisition of the base from the U.S. Army who had operated Kings Bay as a military ocean terminal for emergency purposes. Thus, this development of Kings Bay as the East Coast homeport for *Trident* submarines will follow and expand upon development currently underway for part of the Atlantic Fleet's FBM submarine force.

Both missions will continue to exist simultaneously at Kings Bay, as those facilities now under construction in support of the continuing FBM submarine mission are expanded and new facilities are constructed to accommodate the *Trident* mission requirements. The base also has the expansion potential within existing real estate to support as many as two *Trident* submarine squadrons and two submarine tenders with associated FBM submarines.

Naval Submarine Support Base, Kings Bay encompasses 12,000 acres of government-owned real estate plus an additional 4,000 acres under restrictive easement. The



base has been master-planned into four major functional areas: waterfront; industrial and weapons; personnel support, administration and training; and family housing.

The primary features of the *Trident* waterfront area include two refit wharves, an ashore drydock, (or graving dock), and explosive handling wharf, and a magnetic silencing facility. The facilities are in addition to those now in use to support the *Simon Lake, Oakridge* and existing waterfront functions. The refit wharves, approximately 640 feet long and 100 feet wide, will support maintenance and repair of the *Trident* submarine including the removal and reinstallation of shipboard components, maintenance of onboard equipment, hull maintenance, and supply provisioning.

The drydock will be 690 feet long, 90 feet wide, and will have a 43 foot sill depth. Drydocking the *Trident* submarine will allow extensive hull repair and preservation as well as other repair work not normally accomplished at a refit wharf.

Strategic missile and defensive weapons loading and off-loading will take place at the explosives handling wharf, a 640-foot facility located parallel to the waterfront with controlled access to and from the weapons storage areas. Located at the southern boundary of the base, the magnetic silencing facility (MSF) will measure a submarine's magnetic signature as it returns from patrol and will alter that signature as necessary while the submarine is moored within the MSF's electromagnetic field.

Waterfront construction and operation of the *Trident* submarine in the Kings Bay area will require extensive dredging. Channel widening and extension will require the removal of as much as 20 million cubic yards of material, most of which will be pumped ashore and deposited in land disposal sites. The approach from the St. Marys inlet to Kings Bay is about 6 miles long and was widened to 300 feet for the current Kings Bay mission. The planned dredging program will widen the channel as much as an additional 200 feet as well as construct an additional 600 foot radius turning basin. Project depths will vary from 42 feet in the basins to 44 feet in the outer channel.

Dredged material from the vicinity of the St. Mary's inlet will be deposited in an EPA-approved ocean disposal area or used on nearby Florida and Georgia beaches for beach nourishment. Although most of the dredged material from the upper channels and Kings Bay area will be placed on shore disposal sites, some materials will be recovered for use in base construction and road projects. Hydraulic dredging techniques will remove most of the bottom material, although it may be necessary to remove rock by blasting and dipper or clamshell dredges.

Weapons storage and handling facilities as well as industrial support facilities will be located in the central portion of the base. Since *Trident* missiles will continue to be assembled in Charleston, S.C. and shipped by sea to Kings Bay, strategic weapons facilities to be constructed will support missile handling and storage requirements only. Included are 40 magazines and eight new buildings in a 200 acre area cleared of all trees and shrubs to provide unobstructed security visibility. Should the decision be made to deploy the *Trident-II* missile, missile production facilities would be constructed at Kings Bay to include approximately 25 buildings and 60 storage magazines. These buildings will provide shops, assembly, and storage areas for missile components. Nearby, another group of facilities will provide support for the defensive weapons carried by the submarines. This complex consists of torpedo and warhead storage magazines, shop space, and supply storage areas.

Industrial facilities will include shops and administrative space for submarine maintenance and repair. Designed to reduce in-port maintenance time, the *Trident* submarine is equipped with many modular systems and components. Removal of modules requiring maintenance and repair and replacement with identical, operational ready-to-go modules will provide an at-sea availability time greater than that now attainable with current FBM submarines.

Located within the same area, base public works and supply facilities will provide the required support to

Potable water from a series of deep wells is treated and stored in utilities area.

Carving the road network out of the Georgia coastal forest.

maintain and operate buildings, equipment, vehicles and utilities of the submarine base.

The greatly expanded base will require a vast network of modern utilities systems and roads. Beginning in FY-82 and continuing each year throughout the construction program, projects totaling well over $450 million will construct electrical distribution, water treatment and distribution, sewage collection and treatment, central heating and cooling, roads and drainage systems.

Sewage will be treated to a tertiary level, including, as the final step, spray application of treated effluent over approximately 650 acres of pine forest in the north-central regions of the base. The base-wide energy system will include a central thermal plant which will serve the majority of facilities in the industrial and personnel support areas. Use of coal or wood as the primary fuel is under evaluation.

Since the site is generally flat with many swamps and wet areas that drain poorly, site drainage presents unique engineering problems. The addition of many acres of impervious surfaces in the form of roads, roofs and parking lots adds to the problem. To minimize the impact of storm water runoff to the natural drainage basins on and off the base, a series of storm water retention ponds will be constructed. These retention ponds will be sited and contructed in a way which will aesthetically complement the buildings and other facilities constructed on the base.

The *Trident* Training Facility will be a major complex located in the personnel support area. This facility will offer new student and refresher training in the operation of *Trident* submarine systems in a variety of classrooms, laboratories, and workshops. "Hands-on" experience will be obtained as the students work on and study equipment identical to that found on board the *Trident* submarine. Also located within the personnel support area, community and personnel support facilities will either be expanded or newly constructed. Facilities currently under construction to support the present phase of development and which will be expanded under the *Trident* program include Navy Exchange retail store and cafeteria, medical and dental clinic, family services complex, theater, recreational complex, child care center and library. New facilities include a commissary, post office, chapel, religious educational building, and housing to accommodate over 1300 unaccompanied enlisted personnel.

Eight hundred units of Navy family housing are planned for the northwestern portion of the base, adjacent to the 250 units now under construction and 150 units under design for the FY-82 program. These additional 800 units will be constructed only if necessary to supplement privately-developed housing in nearby communities.

A construction program of this magnitude as well as

TRIDENT
Submarine Base

(Continued from preceding page)

operation of an expanded submarine base at Kings Bay is not without environmental effects. Major environmental concerns of federal and state agencies and regional interest groups began to crystalize during the public review period after publication of the Draft EIS and were addressed in detail in the Final EIS.

Dredging, disposition of dredged material, loss of wetlands, impact on endangered species, and the social/economic impact resulting from rapid population growth are the major environmental impacts associated with base construction and long-term operation.

The dredging program, which begins in FY-82 in the vicinity of the new waterfront facilities, continues through the life of the construction project, and concludes with the dredging of the St. Marys entrance channel. The dredging involves the removal of as much as 20 million cubic yards of sand, silt, and limerock and is estimated to cost in excess of $75 million. A dredging program of this magnitude could alter channel circulation patterns and substrate erosion and deposition patterns.

Dredging and increased vessel activity can increase dissolved oxygen level depression, turbidity and level of organic materials, and could disrupt or eliminate populations of benthic organisms in some channels and basins. To minimize dredging impacts, the Navy, working closely with the Army Corps of Engineers (the agency responsible for issuing dredging permits), is formulating all dredging plans to meet the requirements of the Federal Water Pollution Control Act (Public Law 92-500) and the Clean Water Act of 1977 (PL-95-217). Of major importance is a water quality monitoring program which is already underway to establish a baseline against which all future actions can be measured.

Approximately 80 acres of wetlands, including about 24 acres of salt marsh, will be lost to dredge material disposal areas and waterfront construction. Although offshore (island) material disposed sites will be used within Kings Bay, and placement of suitable sand on nearby beaches is under consideration, the vast majority of dredged material must be deposited on the mainland. Once again, plans are being formulated to avoid environmentally sensitive areas such as salt marsh and wooded swamps.

Impoundments to hold the material will be built inland rather than along the marsh shoreline. Much of the inland areas are either pine forest or sites previously developed by the Army for material and equipment storage areas. Dredge material disposal areas will be revegetated and developed, to the maximum extent, into suitable wildlife habitat.

In areas to be developed for roads, utilities, buildings and other facilities, native vegetation will, in general, be left undisturbed unless clearing is necessary for construction or security purposes. Efforts will be made to leave small stands of hardwood trees or cypress swamps wherever possible.

To further mitigate impacts which may occur to fish and wildlife communities, discussions have been continuing with representatives of the Department of the Interior/Fish and Wildlife service (FWS), and the Georgia Department of Natural Resources. Plans are being made to create inshore fishing reefs using dredged limerock, impoundments for waterfowl, nesting sites for shore birds, and base-wide wildlife management areas. Specific, detailed plans have been proposed to the FWS pursuant to the Endangered Species Act for the protection of the Florida Manatee, or Sea-Cow, and the Eastern Indigo Snake.

Of paramount importance in these plans are education programs dealing with endangered species on the base. These programs will be developed to acquaint all base employees, residents, and their families with the requirements of the Endangered Species Act and their responsibilities to protect these endangered species while living and working at Kings Bay.

When the base is fully operational in the late 1990's, the base work force will have grown by almost 8000 persons over the 3000 currently on-board. Family members of this new work force residing in the Kings Bay region will number approximately 10,600, yielding an increase attributable to the *Trident* program of 18,600 by 1998.

Additional persons will be drawn to the region to support the basic population and may result in a total of 22,300 new residents by 1998. Of these new residents, over half are expected to settle in Camden county, Georgia, about 25% in Duval County (Jacksonville) Florida, and the rest spread throughout the remaining region.

The population influx will create a significant demand for schools, housing, municipal services, public health and welfare services, and transportation systems. Because the impact area is primarily rural, the community character and cohesion, especially in Camden County where the present population of 15,000 is expected to double, will be significantly altered.

To manage this significant construction effort within the framework of an effective environmental protection program and sensitive community impact program, the Naval Facilities Engineering Command relocated the Officer-in-Charge of construction (OICC), *Trident* from Bangor, Washington, to Kings Bay, Georgia, on 1 October 1980. OICC *Trident* had been organized in 1974 with the specific mission to plan, design, and construct the first *Trident* submarine base at Bangor, Washington. With the West Coast construction essentially complete and the requirement to expand Kings Bay into a new strategic submarine base for the East Coast, the OICC was able to relocate his office—complete with desks, typewriters, and a nucleus of *Trident* experienced engineers—to Southeast Georgia.

With design well underway for the FY-82 and 83 construction programs and construction management responsibilities already assumed for construction work authorized through FY-81, the OICC *Trident* organization at Kings Bay is expected to grow to 20 Civil Engineer Corps officers and 200 civilian employees by the mid-80's. During peak construction years, contract awards are expected to range between $200-300 million annually. □

'Security Envelope'

Concerned with physical security systems, Navy research is evolving a new discipline which includes the total facility.

By NANCY DUNN de LAVAL

• Port Hueneme, Calif.

Like most industrial facilities, the Navy incurs losses from theft, vandalism, wrongful destruction, embezzlement and other illicit acts. The loss of these assets and replacement costs can degrade the Navy's operational response.

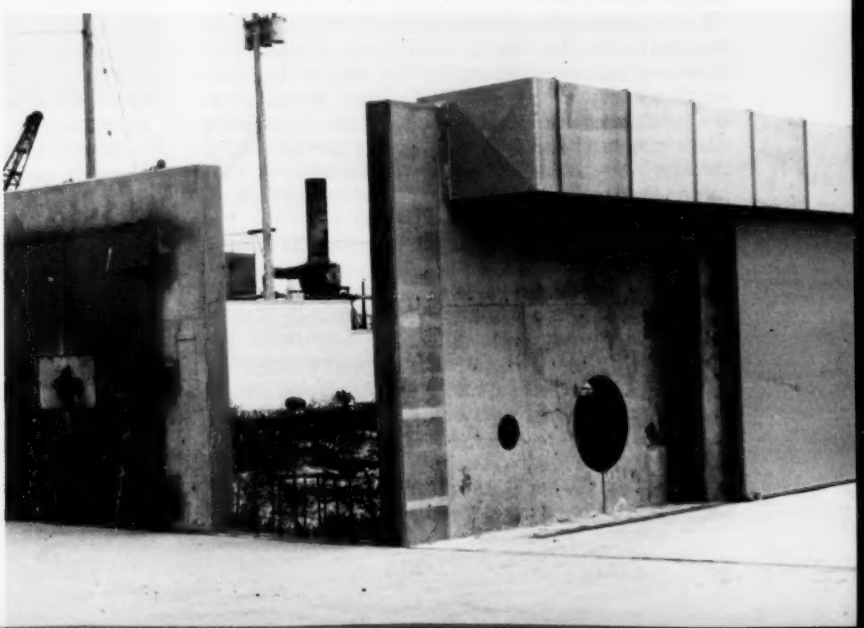
The Navy consequently has become increasingly concerned with its physical security systems. In 1974, it established the physical security laboratory as part of the Civil Engineering Laboratory, Port Hueneme, Calif. Here, in a research environment, security engineering is evolving as a new potential discipline — and along with it a philosophy easily translated into technological concepts.

This philosophy is that security engineering must become fully integrated with facility planning. Currently plans are being developed which would include detailed security, technologies into the planning, layout and design phases of construction.

A key term is "security envelope," used by the laboratory in referring to the total facility as well as to a given structure within the facility. "Envelope," used in a limited sense, can include not only a structure itself but also bullet resistant clothing for personnel who might protect the structure. On a larger level, it can include not only the shore-located bases but also any related fleet or sea operations.

The shore facility program, for example, includes port systems design for Navy ships in the 1990's, and going hand-in-hand with the development of this project, is security technology to protect ships while at those ports. Security will be integrated into the port system configuration, including shoreline barriers, land/water interface barriers and ocean barriers.

The laboratory is further developing underwater intrusion detection systems and the structural framework on



THE DOOR and window test pad is designed for evaluating entrance configurations against forcible entry and also for testing high security locking systems.

A high security locking system which represented the best state-of-the-art against subversion was submitted, but discovered to be vulnerable. Consequently, a new concept for high-security locking systems was designed and developed and added to the Navy's technology.

which to install them. In the shoreline environment, it is looking at corrosion resistance materials and anchorage concepts to prevent intrusion via drainage channels and soil-washouts under the barriers.

The research involves protection of the ships themselves and special weapons facility locking systems aboard those ships. A working relation with federal intelligence agencies, and other defense agencies such as the Defense Nuclear Agency, bring to the laboratory an array of technical projects. One of these projects, sponsored by the Naval Sea Systems Command (NAVSEA), involves improving devices and concepts for securing shipboard launch control systems.

A high security locking system was submitted to the lab by its inventor and manufacturer as representing the "best state-of-the-art against subversion." Lab personnel, convinced that technology has not yet produced a barrier that can't be penetrated by a motivated, skilled, and properly equipped intruder, discovered vulnerabilities in the system.

For two years, personnel at the lab assisted in redesigning, developing and testing a new system. As a result a new concept for high security locking systems and a new barrier device for use on the launching control system were added to the Navy's technology.

Lock technology is only one phase of a "security envelope." In facility planning, the security engineer studies the location of structures and traffic flow; e.g., are buildings which are highly patronized (the Navy Exchange or O'Club) located near a main entrance, thereby decreasing traffic near arms rooms or high security communication facilities? Are perimeter barriers reinforced by existing natural barriers such as swamp lands, cliffs, desert spaces, etc.?

The laboratory has adopted the technological concept of "commensurate strength"; i.e., the design of the facility must be such that barriers, natural or man-made, complement and reinforce each other to achieve the stipulated degree of attack assistance.

The concept of "commensurate strength" is also applied to a given structure: i.e., walls, floors and ceilings must be constructed of materials of equal resistance to penetration. The concept applies not only to new construction but also to retrofitting projects. The Department of Defense (DOD) has set the guideline: ". . . that the resultant penetration resistance and protection provided (by retrofit improvements) are equivalent to those required by new construction."

The Navy is conducting intensive investigations to establish forced entry delay times of different materials, designs, and configurations. The structures will be categorized in their entirety, or by sections, in terms of physical attack resistance (hand and power tools), ballistic attack resistance (small arms) and explosive attack resistance (shaped charges and bulk explosives). The result of these investigations will be a uniform set of design criteria for structural elements which will meet the DOD resistance standards.

One project currently underway at the laboratory is the development of a completely new family of intermediate size doors. The doors are designed for armories, airfield-ready service lockers, communications facilities, crypto rooms, high-value storage areas and work areas for classified or restricted material.

Integrated with the door design will be the frame, mounting hardware, actuating mechanisms for power-driven doors, hasps, locks, latching mechanisms and sophisticated controls. One design, under development for one agency, calls for a locking system mounted on the back or integrated within the door itself and reached only by highly skilled means. For ordnance structure doors, the laboratory is working on design and concepts which offer greater resistance to forced entry. The new family of doors will not only increase the attack resistance of structures but will ultimately lower costs by reducing guard requirements.

Hand-in-hand with the development of the security doors are investigations for barrier designs and materials for other structural apertures — windows, skylights, vents, utility ducts, etc. The investigations include framing and attachment hardware, glazing materials (such as glass, acrylics and polycarbonates), and gratings.

Presently underway is an effort to develop a modular grill system which, when installed, will interlock and become completely self-locking without the use of heat-producing equipment. This system is being developed in conjunction with the Naval Facilities Engineering Command's effort to remodel approximately 7,000 munition magazines, armories, and arms rooms. A self-locking grill system, capable of being installed without welding equipment, will negate removing thousands of tons of munitions from the magazines while they are being renovated.

THE NEW ballistic test facility (right) will be operational next year. With a 25-yard range, it is designed to test various types of materials against ballistic attack. The gun can be fitted with barrels up to .30 caliber and can simulate various power loads and distances. A chronographic system permits control of the projectile's speed.

For walls, floors, and roofs, wide variety of opaque armor and ballistic-resistant construction material exists as protective plating. The problem is least complex when new construction is involved and desired levels of ballistic resistance can be built into the walls of the structure.

For existing buildings which do not have the structural capability of supporting attached ballistic hardening, several alternatives exist: a separate free-standing wall; a berm of either sand or earth; wooden or steel form filled with sand or crushed rock; a free-standing shield of metallic armor, or ammunition boxes or missile containers filled with sand and stacked in the required height and thickness.

Existing buildings with adequate structural support capability may be hardened by adding a veneer of ballistic-resistant material. The selection and placement of veneers depend on the inherent ballistic resistance of the existing structures. The physical security lab has a ballistic test facility which is used to test retrofit and new construction ballistic hardening techniques.

Several factors influence resistance to forced entry.

Several factors influence forced entry resistance of structures and their subsystems:

- Hardness as related to the anticipated attack tool. Surprisingly, the lab has found that hard materials are more resistant to certain power tools than to hand tools.
- Total mass of the barrier.
- Discontinuities, in the structure itself (cavity walls) or in the device.
- Multilayer systems (different materials to resist both hand and power tools).
- Increasing the "threshold of attack" by forcing a tool change (e.g., force the intruder to use a tool which needs power and which is noisy).

In applying these technological concepts to structural systems, the laboratory accepts the fact that physical barriers will not in themselves provide positive and permanent denial of access to a determined intruder. Only to the casual "tamperer" with screwdriver or crowbar does it guarantee a 100% penetration resistance for its barriers.

For the more sophisticated intruder, the laboratory is guided by a philosophy of "attack resistance" instead of "attack proof." It develops barrier systems which together provide the degree of penetration resistance needed to allow sufficient delay times for a proper response by a guard force.

When the physical security lab was established in 1974, it was confronted by a rather acute need for a quick response data base. Data relating to physical security were scattered through a wide variety of documents. The only quick response data base resided in the memories of a handful of senior physical security technologists scattered throughout the government.

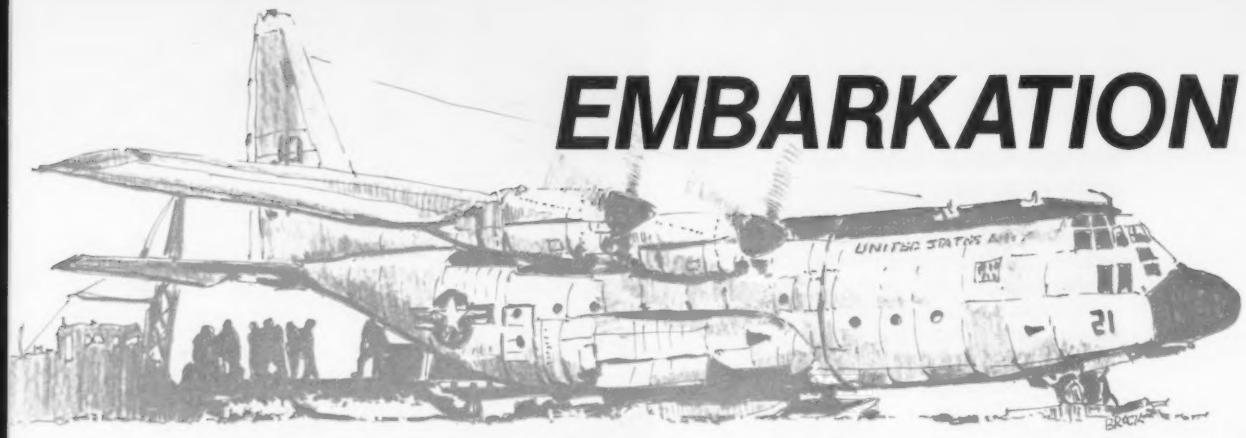
To improve its quick response capability, the laboratory is developing an in-house physical security data management system (PSDMS). This system is designed for receipt, storage, and retrieval of all types of information and data on subjects related to physical security RDT&E for the Navy. The end system will be capable of retrieving individual test data reports and making data searches at several levels. It will identify specific reference documents which provide answers to broad questions such as, "What work, in and out of DOD, has been done in the area of attack-resistant constructions?" or on succeeding levels of specificity. The system will include test and performance data on specific military specifications and proprietary items will be retrievable.

Reinforcing the data management system is a private collection of rare books and historical documents, gathered over many years by one of the lab's physical security specialists. Research from this collection has been used in several litigations as "expert testimony." The collection will eventually be indexed for easy access.

Since its establishment, the physical security laboratory has earned DOD-wide recognition for its expertise in the field of security engineering.

Its work is not only advancing the state-of-the-art at a rapid pace but also providing a key contribution to establishing security engineering as a professional discipline. □

EMBARKATION



By EAC TIMOTHY F. BUCKLEY, USN

P.E., Calif.

• Port Hueneme, Calif.

Mobilization readiness is the requisite to successful military operations and the Naval Construction Force (NCF) is constantly honing its mobilization edge through classroom training and readiness exercises. The exercises are conducted in-house, i.e., the battalion conducts the exercise internally or in conjunction with the Naval Amphibious Force, U.S. Marine Corps, or the U.S. Air Force.

The readiness posture is further enhanced with frequent mobilization conferences and studies conducted by the Naval Facilities Engineering Command to review and modernize NCF mobilization techniques, supplies, and equipment. Preparations and refinements are continuous to ensure the NCF will be ready to respond to assigned missions.

War plans are made to ensure that combat and support forces and equipment and material required in the objective area arrive at the proper time. War planning is accomplished by the Joint Chiefs of Staff. The plans cover various war scenarios throughout the world.

One function of the War Plan is to set transportation priorities; to make certain that the forces required to be in the objective first will have priority transportation. The United States has a limited number of cargo aircraft and ships to move troops, equipment, and supplies in a major contingency operation.

To augment the aircraft and ships, the U.S. Air Force can call up the Civil Reserve Air Fleet (CRAF) and the U.S. Navy can call upon the Military Sealift Command (MSC) to furnish ships. Two types of ships currently being evaluated are the container and roll-on/roll-off ships. The Naval Civil Engineering Laboratory (CEL) and the U.S. Marine Corps have been studying for some time the use of these ships in amphibious assault support. The Naval Construction Force must work closer with CEL and the USMC to perfect the state-of-the-art in amphibious warfare.

The NCF itself needs to take a hard look at the Table of Allowance for the P-25 component of the Advance Base Functional Component (ABFC) System, that is the Naval Mobile Construction Battalion Table of Allowance (NMCBTOA). It appears that over the years the NMCBTOA has grown with supplies and equipment to meet the *peacetime construction missions.* This has overshadowed the construction and military requirement for wartime.

Those who are responsible for providing information to the War Plans group should be concerned with the size of and the effort required to move a Naval Mobile Construction Battalion. The NMCBTOA should contain the basic supplies and equipment to construct an advance base using the ABFC system.

The air echelon with the transportation requirement for sixty-six cargo aircraft appears to be impractical. The Air Detachment Table of Allowance (TA-41) is currently the only practical air-deployable element within the NCF. However, the NCF should revamp the TA-41 to make it an even more transportable commodity. It should be able to move from the arrival airfield to the Objective Area in a *single* motor convoy movement. To accomplish this, supplies may have to be reduced or cargo trucks added.

The remainder of the Table of Allowance should be placed in the sea echelon. The majority of the supplies in the TA-41 are packed in large single-trip containers that require material handling equipment (MHE) to move them. MHE is scarce during any contingency operation and may not be in the objective area early in the operation. The majority of the supplies can be repacked on four cubic foot (40″ x 16″ x 16″) containers, the size adopted by the Marine Corps. It fits on the standard warehouse pallet (40″ x 48″) and can be manhandled by the troops in the field.

The NCF must be ready to meet emergency situations, whether it is to build and advance base of airfield using the ABFC System, accomplish battle damage repairs, or to provide disaster recovery operations. To facilitate mobilization, two mount-out flow charts are utilized. They are: the 48-hour countdown used for the Air Detachment; and the six day countdown used for the remainder of the NMCBTOA.

The standard operating procedure currently in use by the Commanders of the Construction Battalions Pacific and Atlantic is to issue a *Warning Order,* followed by an *Amplifying Order,* and then the *Initiating Order.*

For an illustration, let's use the 48 Hour Air Detachment Mount-Out to give some idea of what can be accomplished when the Standard Operating Procedure is followed. The battalion that is mobilization ready

begins the mount-out procedure when the Warning Order is received. The Warning Order, just as its name implies, alerts the battalion of a contingency somewhere in the world. It could be a disaster recovery operation, repairing a battle-damaged base or constructing an advance base or airfield.

The battalion begins by identifying what equipment, supplies, and personnel that may be required to accomplish the mission. Personnel records are checked for emergency data, identification of sole surviving sons, etc. Updating and checking service records will allow office personnel to augment the working parties should the need arise when the Initiating Order is received. Likewise, medical and dental records should be checked. Personnel requiring shots are given them now; thus ensuring that any side effects that may be deleterious to working parties of Air detachment personnel pass prior to final embarkation.

The Embarkation Officer has checked his Mount-Out control center file to ensure he has all required charts, updated instructions, etc., and is in the process of identifying required working parties. These are a few of the items that can be accomplished early in the mount-out procedure. The battalion that waits until the Initiating Order is received to begin mount-out preparations places itself under a severe handicap.

The Amplifying Order is the next to be received. The battalion may receive more than one Amplifying Order as the situation may change in the objective area. This order gives the battalion all the current intelligence and information concerning the contingency situation. The battalion can now proceed with initial tailoring of the Air Detachment and forward to the cognizant USAF command the initial airlift request. This will alert the command controlling the aircraft, usually the Commander in Chief of the Theater of Operations to which the air detachment is deploying.

The U.S. Air Force wants to use every available inch of cargo space in the aircraft; the weight and cube are very important, it tells the aircraft schedulers how many aircraft to schedule. It is not unreasonable to assume the air detachment equipment and personnel may be transported in Military Airlift Command C-141 aircraft and the palletized cargo be transported in Civil Air Reserve Air Fleet (DC-10, C-747, or C-707) aircraft.

A delay in submitting the airlift request may result in a major reconfiguration effort if the battalion configured for *eleven* C-141 aircraft and the aircraft scheduler *seven* C-141 aircraft and *two* C-707 aircraft.

The Mount-Out Control Center is placed in operation with a reduced staff to monitor and control the mount-out activity. Equipment cleaning and preparation may commence. Packing of some supplies may commence. Working parties and the Departure Airfield Control Group (DACG) can be briefed of duties and responsibilities. If it is necessary to shut down projects, now is the time to do it and turn the inventories over to the cognizant commands. The minicomputer can be of assistance in the mount-out evolution by identifying personnel and equipment.

When the Initiating Order is received the Mount-Out Control Center is fully staffed and placed in twenty-four hour operation. Staging of cargo is started. Staging areas are usually congested. Using a predetermined grid layed out in the staging area allows the staging area crew to weigh and mark equipment and cargo and then place each piece of equipment of pallet of cargo on an assigned grid square. Grid number, weight and center of balance (dimensions also for equipment) are forwarded to the load planners.

Load plans are sent to the staging with the grid numbers of the cargo and equipment; the staging crew can start to place cargo and equipment in chalk in accordance with the load plans. The Departure Airfield control Group is dispatched to the departure airfield to make the necessary preparations. The Airlift Request is updated. These are a few of the important operations to be accomplished. However, getting as much as possible completed before the Initiating Order is received permits a smoother mount-out.

There are two other methods of embarkation mentioned. ("Tactical Embarkation Manual," COMCB-PAC/COMCBLANTIIST 1510.1 Motor Convoy and Rail Transportation.) There are certain restrictions placed on motor convoys by the North Atlantic Treaty Organization (NATO) countries. The major war scenarios are presently in the NATO countries and correct convoy procedures must be followed. Once the air detachment or sea echelon arrives, it may have to be transported by motor convoy or rail to the objective area.

The concept of operations for strategic airlift require the NCF to use motor convoy to move to the objective area from the arrival airfield. Rail transportation may be used to move elements of the NCF from Naval Construction Battalion Centers to Ports of Embarkation to load aboard Military Sealift Command container or roll-on/roll-off ships.

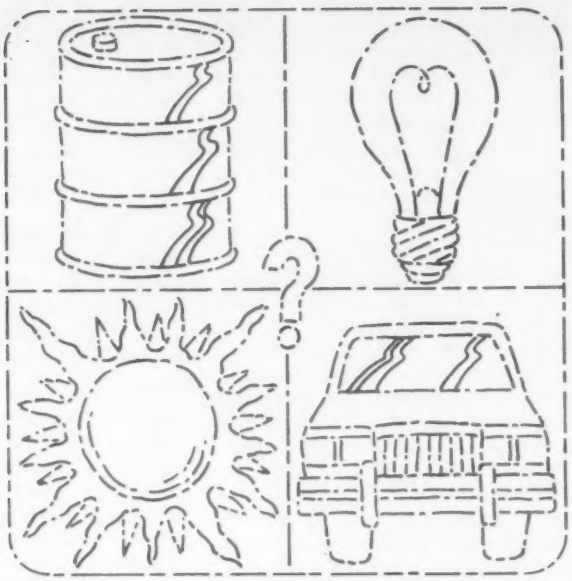
The Naval Construction Force must place more emphasis on mobilization training and a little less on peacetime (civil type) construction. To meet the requirement of peacetime construction many pieces of heavy equipment have found their way into the Naval Mobile Construction Battalion Table of Allowances. While this equipment may enhance the peacetime construction capabilities, it causes problems for those charged with embarkation for military operations. When replacing equipment in the NMCBTOA we must be concerned with two questions:

Does the Naval Construction Force require the equipment to construct the ABFC?, and,

Can it be easily loaded aboard amphibious ships or aircraft? If the answer to question one is yes, then all equipment should be test loaded. The test loadings should be witnessed by the manufacturer. Any modifications required to permit loading should be made by the manufacturer prior to placing in the Table of Allowance.

To ensure the NCF will be able to meet its mission we are going to require more essential supplies and equipment on fewer aircraft and ships. □

Low-cost projects save!



By GARY W. BIGGERS
NESO

• Port Hueneme, Calif.

How is your installation handling its energy conservation efforts? Are you waiting for your energy conservation ship to come in? When will that anticipated ETAP or ECIP project come that "will give your base the necessary energy savings?" Well, if you wait too long for the ship, it may not have enough fuel to get there. And, while you are waiting, there are many low cost projects that can be accomplished that will save energy and money. Here are a few.

Heat exchangers are designed to transfer heat from a warmer to a cooler substance. When they become fouled with oil or dirt on the surface the "insulation" impedes the beneficial flow of heat from one material to another.

The Navy Regional Medical Center (NRMC) San Diego, Calif., contracted to have condenser coils on 34 air conditioning units cleaned at a total cost of $780. This resulted in a savings of electricity estimated at more than $30,000 per year!

There are many other pieces of equipment that use heat exchangers including cooling towers, heat pumps, and economizers. Such equipment are targets for energy conservation merely by keeping them clean. Take a look at your heat exchangers.

Since 20 to 40% of all energy used in the United States passes through boilers, they offer a great potential for energy conservation.

A properly tuned boiler, like a properly tuned automobile, can significantly reduce fuel consumption. As an example, a typical 20,000,000 Btu / hr capacity boiler operating at 75% combustion efficiency will use about 500,000 gallons of fuel oil per year. The same boiler, properly tuned, can register a combustion efficiency of 83%. This yields a yearly fuel savings of 48,000 gallons at a cost of $33,600!

While tuning a boiler will increase combustion efficiency, the heat of combustion must be transferred through heating surfaces to water in order to make steam or hot water. If these heating surfaces (heat exchangers) are sooty, a loss of heat transfer capability can occur. A one eighth inch (1/8") layer of soot can increase fuel consumption by 8½%. And, even a soot layer as thin as one thirty-second of an inch (1/32") decrease efficiency by 2½%!

Small, seemingly insignificant, steam leaks can be sites for significant energy and monetary losses. A leak, one eighth inch (1/8") in diameter, in a 100 psig steam line where steam costs $6.00 per 1000 pounds will waste approximately 667,000 pounds of steam per year at a cost of $4,000. A leak, one quarter inch (1/4") in diameter, in a 100 psig steam line with the same steam cost will waste approximately 2,500,000 pounds of steam per year at a cost of $15,000 per year. Steam leaks are easy to spot and certainly not inconsequential.

Electrical energy consumption for lighting is a large portion of total energy consumption. The typical building was erected before energy was limited and costly. Lighting systems were designed for low maintenance because electricity was less expensive than labor and replacement parts. Today, the typical building is overilluminated by as much as 25% to compensate for dirty light fixtures and burned-out bulbs that might occur from low maintenance priority.

Electrical energy savings can be realized by removing unneeded lights and by developing a regular lighting

maintenance program. Lighting fixtures should be cleaned at regular intervals. Light bulbs should be changed before they burn out. A typical lighting maintenance program will call for the changing of lights at 75-80% of their rated lifetime. The extra cost of light bulbs will be more than offset by the savings in maintenance. It is less expensive to change a thousand light bulbs in one sweep than it is to change a thousand light bulbs a few at a time. Lighting requirements can also be reduced by using light-colored surface coatings inside the building.

It is common practice in many industrial buildings to leave lights burning 24 hours a day, 7 days a week. This is possibly acceptable if the building is actually in full use all of the time. But many buildings operate with only a standby crew at night and weekends. Few building lights are needed so a few people can watch a telephone.

A large machine shop at a Southern California naval activity operates two shifts per day, five days per week. The building is manned by a small, standby crew at all other times. The building lighting load was at the maximum at all times. When the lighting level for the building was reduced to 25% for 7 hours per week night and during the weekend the electrical energy consumption was reduced by 1 million kwh per year. This saves approximately $45,000 per year. An after dark inspection can easily detect the glowing discrepancies on your facility.

Similar savings can be realized by curtailing heating and ventilation during hours of low building occupancy. The heating and ventilation system can be turned off an hour before quitting time. Few people will notice the slow drop of a few degrees of temperature so close to quitting time.

Many industrial processes are not utilized to their capacity. This might occur because products are temporarily in low demand. It may not be feasible to replace the equipment with smaller equipment because any increase in demand will require the large capacity. Most equipment, when not used to its full-rated capacity, is not energy efficient. Partially-loaded motors cost more to run per unit of work than fully-loaded motors. Thermal loads, such as foundry heaters, use much more energy per unit produced when partially utilized than when fully utilized.

Many under-utilized processes can be made more efficient by employing a "batch-type" system. As an example, suppose a process is capable of turning out 400 products per month. But, at this time, only 100 products per month are required. It is more efficient to run the process at full capacity for one week, then shut down for three weeks than to run the process at 25 products per week. How many under-utilized systems are running partially loaded at your base?

There are many small, relatively inexpensive ways to save energy. The above are just a few of the ways. There are many more areas on your base where a little time and money will provide major savings. □

Advice of Counsel

About Attorneys' Fees

By WILLIAM H. SPECK
NAVFAC HQ

Concerning attorneys' fees an old joke goes:

Client: "What is your fee?"

Lawyer: "$100, and for that you get two questions."

Client: "Isn't that a little steep?"

Lawyer: "Yes, it is; what is your second question?"

But this story is the good news, for the bad news is that sometimes the losing litigant has no choice but to pay his adversary's attorney's fees.

The English rule for seven hundred years by common law and then old statutes allowed counsel fees, first to successful plaintiffs and then successful defendants, now accomplished by "taxing Masters" according to detailed schedules.

The American rule has been that litigants paid their own counsel fees, absent a statute or contract provision specifying reimbursement, and except where the litigation resulted in recovery of a fund or property that could be charged the costs or where the losing party disobeyed a court order or had acted in bad faith, vexatiously, wantonly, or for oppressive reasons.

However, in addition to the small fees allowed as costs by the Revised Statutes and Judicial Code (28 U.S.C. 1920 and 1923(a)), some thirty statutes now provide for counsel fees as part at least of plaintiffs' remedies. *Alyeska v. Wilderness Society*, 421 U.S. 420 (1975).

The United States as a litigant has been expressly protected from attorneys fees by general statute (28 U.S.C. 2412); but many statutes now provide attorneys fees as part of the remedy against the Government. Among the more important are the Freedom of Information Act, 5 U.S.C. 552(a) (4) (E), the Clean Air Act, 42 U.S.C. 1857f and 1857h-2(d), the Federal Water Pollution Control Act, 33 U.S.C. 1323 and 1365, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, 42 U.S.C. 4654(a).

At the end of the 96th Congress, the Equal Access to Justice Act, P.L. 96-481, 5 U.S.C. 504 and 28 U.S.C. 2412 authorized courts to allow attorneys fees to small business firms and individuals prevailing in suits against the United States, unless the Government position is found substantially justified or special circumstances make such award unjust. Boards of Contract Appeals claim the same authority.

Attorneys fees may be the largest part of plaintiffs monetary recovery against Governments. In *Emeny v. United States*, 526 F.2d 1131 (Ct. Cl. 1975), plaintiffs recovered $221,880 plus interest and plus attorneys fees of $341,346.60. And in personnel suits, the attorneys fees may be many times the employees monetary recovery: newspapers report recommended attorneys fees of $14,692 where the employee had recovered only $1,500 in wages.

The old joke may be a wry comment on some big bites into the Government appropriations. □

S.A.M.E. AWARDS

Peltier Award to NMCB-133

In March 1981, the Society of American Military Engineers' Peltier Award Committee announced that NMCB-133 was to receive the 1980 Peltier Award because of its exceptional performance in the Naval Construction Force. While deployed to Diego Garcia from November 1979 to mid-July 1980, the battalion was deeply involved in the increased fleet activity caused by the hostage crisis in Iran. Through the outstanding efforts of the entire battalion staff, many important projects were completed; the most impressive was the completion of the 1000-man camp within 60 days in time to meet all berthing requirements on the island. Returning to Gulfport, the battalion rapidly responded to two disaster emergencies; Hurricane Allen, and to aid in the construction of a 5000-person facility for Cuban refugees.

Capt Wilson receives Moreell Medal

Captain Eric R. Wilson, Jr., CEC, USN, was named to receive the Moreell Medal for 1980 by the Society of American Military Engineers for his outstanding contribution to military engineering. As Deputy Officer-in-Charge of Construction, TRIDENT (East) during 1980, Capt. Wilson distinguished himself by providing outstanding service as manager of a major portion of the Navy's largest single peacetime design and construction program. He had primary responsibility for the activation of the Atlantic Coast TRIDENT facilities program at Kings Bay, Georgia, as well as the planning, programming, and design of a proposed $1.4 billion construction program there. Capt. Wilson was instrumental in the activation of the east coast TRIDENT facilities at Kings Bay when he became involved in the relocation from Bremerton, Washington.

UT1 Zulick gets Shields honors

UT1 Robert Zulick was selected as this year's winner of the Marvin Shields Award, making this the second year in a row that a member of NMCB-5 has been so honored with this prestigious award. Petty Officer Zulick was chosen for his exceptional performance as Assistant Platoon Commander and Utilitiesman Supervisor. As a member of NMCB-5's Diego Garcia Detail which deployed to the island for eight months, Zulick was responsible for the planning and construction of the mechanical aspects on a number of sophisticated projects. He also served as the minicomputer operator for all of NMCB-5's management and personnel administration programs on Diego Garcia. Winning awards is not new to Zulick. He has also received the Navy Achievement Medal; was chosen the Sailor of the Year at Camp David in 1977; and in 1980 he was selected as NMCB-5's Seabee of the Year.

CLIMBING ONE STEP higher on the "stairway to success" was accomplished by 27 officers in the Civil Engineer Corps Officer Basic Qualification Class at the Naval School, Civil Engineer Corps Officers (CECOS) in March. Capt. Fred Kelley, Commanding Officer of the school and a member of the board of directors of the local S.A.M.E. post, presented one-year memberships to the students. Coming from 24 universities and a variety of backgrounds, the graduates began their jobs in the areas of navy public works, construction battalions, and contracts administration.

RADM John Paul Jones New Vice Commander

RADM JOHN PAUL JONES

• Alexandria, Va.

Rear Admiral John Paul Jones, CEC, USN, Commanding Officer, Western Division, Naval Facilities Engineering Command, San Bruno, California, has been named as the Vice Commander, Naval Facilities Engineering Command and Deputy Chief of Civil Engineers of the Navy in Washington, D.C. Rear Admiral Jones will report for his new assignment later this year.

RADM Jones was born in Brunswick, Ga., on August 7, 1932. He graduated from the United States Naval Academy with the class of 1954 and was commissioned ensign. He received a bachelor of science degree in civil engineering from Rensselaer Polytechnic Institute in August 1957, and a master's degree in civil engineering from Stanford University, in 1961.

Following his graduation from the Naval Academy, Rear Admiral Jones served aboard the USS *Calvert* and various duty assignments as a junior Civil Engineer Corps Officer.

From 1963-65 RADM Jones was operations officer and executive officer of Naval Construction Battalion 4. He also served as officer in charge of the presidential retreat at Camp David, Maryland, until July 1967. He subsequently attended the Naval War College in Newport, Rhode Island, graduating in June 1968.

From June 1968 to July 1970, he commanded Naval Mobile Construction Battalion 62. During this time the battalion deployed twice to the Republic of Vietnam, and received consecutive Peltier Awards.

In 1970, RADM Jones reported to Southern Division, Naval Facilities Engineering Command, where he served as head of the facilities acquisition department.

From 1973 until 1976, he was assigned to Headquarters, Naval Facilities Engineering Command, Washington, D.C., where he served as the assistant commander for construction. From 1976 until 1978, he served as COMCBLANT, in command of the Atlantic Fleet Seabees. Subsequent to that tour, he began his current assignment as commanding officer of the Western Division.

His decorations include the Legion of Merit with Combat "V", the Bronze Star Medal with Combat "V", the Meritorious Service Medal, and the Navy Commendation Medal. He is a registered professional engineer in the State of Virginia.

He is married to the former Wynelle Fender of Brunswick, Georgia, and they have three children: John Paul III, Julie, and Karen. □

Other Flag Notes

Capt. Donald L. Conner Selected for Rear Admiral

Capt. Donald Lee Conner was selected for promotion to the grade of Rear Admiral in the CEC, approved by the President and confirmed by the U.S. Senate. He is currently serving as Commander of the Naval Construction Battalions, U.S. Atlantic Fleet. RADM Conner is a native of Lima, N.Y., and a 1955 graduate of the U.S. Naval Academy. He received a masters degree in management from the Naval Postgraduate School, Monterey, Calif.

RADM Howard Haynes Succeeds RADM Clements

RADM Howard H. Haynes assumed the duties of Commander, Naval Construction Battalions, U.S. Pacific Fleet at Pearl Harbor in April 1981, relieving RADM Neal W. Clements of the post. RADM Haynes was Director of Programs and Comptroller, and was subsequently appointed Deputy Commander for Planning and acting Vice Commander at the Naval Facilities Engineering Command Headquarters.

Naval Facilities Engineering Command
SITUATION REPORT

CONTAINERIZATION OF SEABEE EQUIPMENT - A study has been completed to determine the use of prefabricated containers to store and transport basic equipment currently packed in wooden crates. The study considered transport and storage as prepositioned war reserve material, using the container for storage. A second recommendation concerned transport of the basic needs on a tactical deployment. The study considered the 8x8x20 ft. commercial container as well as the containers (equipment shelters) presently in stock and the newly developed Marine Corps family of containers. The physical attributes and significant handling characteristics of the containers are discussed in detail.

(NAVFAC Code 062)

NAVY SENDS LARGEST MILITARY CONSTRUCTION REQUEST TO CONGRESS - A record FY 1982 MILCON budget submission of $1.5 billion is now before Congress for approval. The request more than doubles last year's submission and is a marked departure from the low MILCON funding experienced during the 1960s and 70s. Major items in the budget are:

	(Millions)
Quality of Life Facilities	
Unaccompanied Enlisted Personnel Housing	176.4
Chapels and Child Care Centers	15.5
Operational Facilities	
TRIDENT	100.2
Diego Garcia	121.0
Other Indian Ocean	50.0
Re-open Long Beach	22.0
Norfolk Pier	35.0
Replacement & Modernizations	
NARF Plating Shops	41.5
Shipyard Modernization	67.6
Other	
San Diego Hospital	204.0

(NAVFAC Code 21)

PUBLIC WORKS

TECHNICAL NOTES

Imagination leads to custom equipment

Hardpan and sandstone ledges at the Naval Air Station, Meridian, Miss., precluded normal efforts of revegetation. Reclamation necessitated ripping, usually up and down hill first and then again on the contour. A depth of 24 inches was needed and cuts were required at not more than four-foot intervals.

No machine with this capability was available either by rental or by contract, so the station forester designed one built from salvage material. A Seabee welder was assigned to assist the forestry department.

The designer had earlier found a discarded railroad rail which became the tongue, crossbars and ripper shank of the device. The wheels, with arched axle, have been removed from fireplow modified to be pulled with a rubber-tired log skidder. The hydraulic cylinder had long before been rescued as salvage. A link of an anchor chain welded to the tongue became a hitch for the drawbar pin. A used, but still usable bucket tooth point was welded to the point of the ripper.

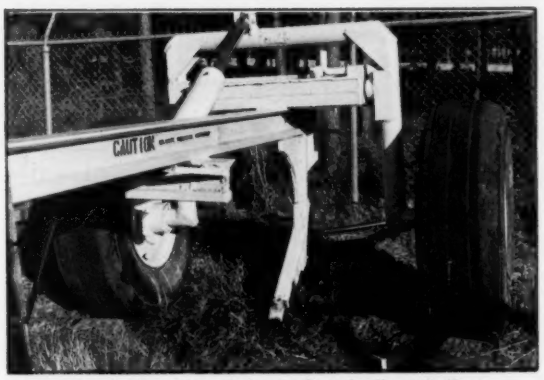
A 100 horsepower 4-wheel drive tractor easily handles the ripping chore without slippage of the tires, but under severe conditions of rock, the ripper can be retracted hydraulically to prevent excessive wear.

Raised letters on the sidewalls of the ripper tires clearly state "Do not exceed 225 miles per hour." They must have been salvaged from some Seabee's sports (?) car.

Ripping hardpan and sandstone ledges facilitates the absorption of water, provides sufficient loose soil for the establishment of grass, and enables tree roots to penetrate the substrata. No longer should denuded areas at NAS Meridian escape reclamation due to impervious soil conditions. When it is not in use, it may be made available to other installations.

Additional information may be obtained from W.E. Frazier, Code 243, South Div., Charleston, SC 29411; Autovon 794-4482, Commercial (803) 743-4482.

A Seabee welder completes welding on the homemade ripper for hardpan and sandstone.



Custom made ripper is built from railroad rails and other salvaged material.

A log skidder tows the hardpan ripper.

Custom equipment breaks hardpan.

Contract Services: Necessary For Survival?

By CDR GEORGE A. ROBERTS, JR., USN
Deputy Controller
Chief of Naval Education & Training
Pensacola, Fla.

Like it or not, increasing numbers of functions; fire protection, security guards, motor vehicle operations and maintenance, classroom instruction, warehousing, and other services required by the Navy will be performed by contract.

Economic programs and limited resources to perform personnel functions are forcing major Naval commands (claimants) to look to the private sector for a third source of manpower — contract personnel. This trend will drastically change the organization of the shore establishment, methods of managing, and overall structure of the Navy.

Is this good or bad?

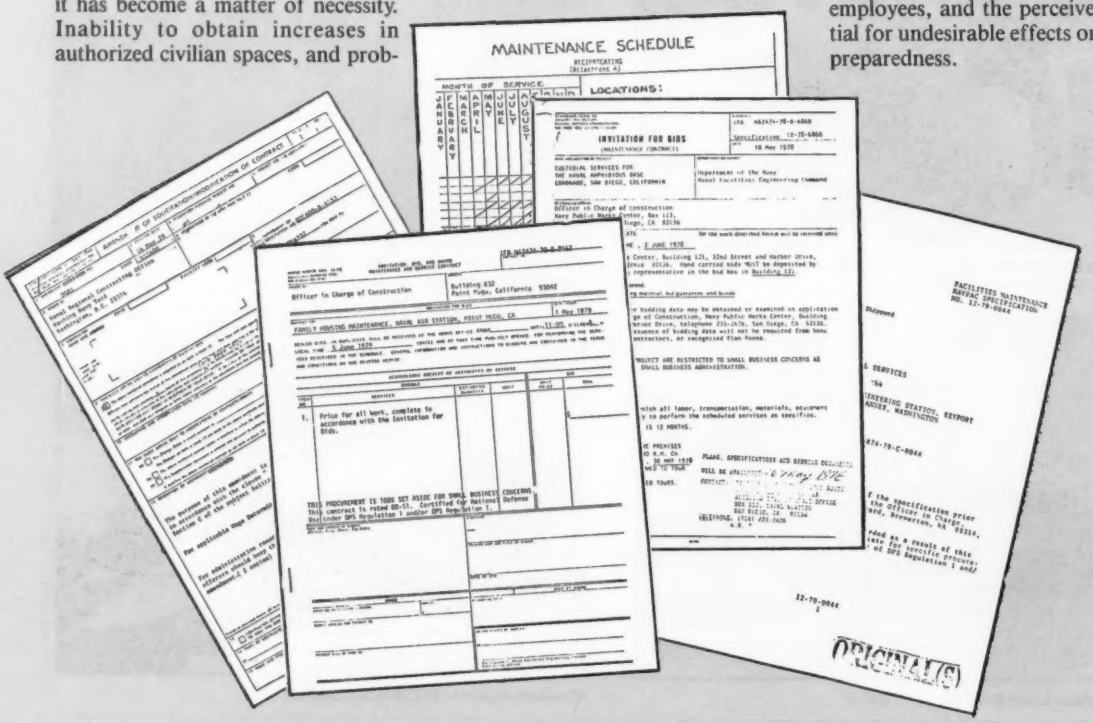
Like all controversial subjects, it depends upon the point of view. From the major claimant viewpoint, it has become a matter of necessity. Inability to obtain increases in authorized civilian spaces, and problems of retention on the military side, are limiting in-house manpower. Also, the Office of Management and Budget (OMB) has directed contracting where economically justified. Consequently, there is little choice but to contract to accomplish our mission and satisfy existing regulations.

OMB Circular A-76, "Policies for Acquiring Commercial or Industrial Projects and Services Needed by the Government," establishes policy and procedures to be used in determining whether commercial or industrial type work should be done by contract or in-house.

The circular promulgates a three-point policy: *first*, the Government should rely on the private sector for goods and services; *second*; certain functions are inherently governmental in nature and must be performed by federal employees; and, *third*, relative cost must be given appropriate consideration in decisions between in-house performances and reliance on private, commercial sources.

These precepts are not new, having been established in 1955 by the predecessor to OMB, the Bureau of the Budget. More recently, a March 1979 revision to Circular A-76 "reaffirmed" this policy and reemphasized the issue of relative economy by including a comprehensive cost comparison handbook.

This concept of economy in government and stimulation of private enterprise is difficult to dispute; like flag, family, and clean air, it is good. However, the program is controversial, due to its effect on civil service employees, and the perceived potential for undesirable effects on defense preparedness.


MAINTENANCE SCHEDULE
INVITATION FOR BIDS
Officer in Charge of Construction
Building 632
Point Hugu, California 93042
FAMILY HOUSING MAINTENANCE, NAVAL AIR STATION, POINT MUGU, CA
Price for all work, complete in accordance with the Invitation for Bids.
ORIGINAL(S)

The policy of reliance on the private sector and economy in government is, in effect, an executive order applying to all agencies of the federal government. It has been implemented in the Department of Defense (DOD) by a program described within DOD instruction 4100.33, "Operations of Commercial and Industrial Type Activities." Compliance with this instruction requires cyclic review of all *CITA* (a DOD acronym for Commercial-Industrial Type Activities, not to be confused with *CETA*, the Comprehensive Education and Training Act), and requires that a firm bid cost comparison procedure be completed if an activity or function cannot be justified for in-house performance for reasons other than cost.

For civilians and military

The program applies to functions performed by military as well as civilian personnel. In the firm bid procedure, the cost of in-house performance, audited for compliance with the A-76 cost comparison handbook and congressional requirements, is sealed and placed in the bid box along with vendors' bids. At bid opening, if the in-house cost is lower the function remains in-house. If a vendor's bid is lower, by ten percent, a contract is awarded. The unsettling effect of the program on employees and management should be apparent.

Enthusiastic support is difficult to inspire. Conversion to contract is unpopular with most employees. Commanding officers see contracting as a loss of control and flexibility. They can cite many discouraging examples of poor service provided via contract.

The program is in conflict with other socio-economic programs such as equal employment opportunity, affirmative action, and even small and minority business incentive programs. In fact, it is in conflict with itself, since the procedures and manpower required to accomplish the task are in direct contrast to the goal of economy in government. Within Congress, mixed opinion and feeling has resulted in many delays and legislated requirements. There are enumerable dichotomies — intentional and accidental — existing in the DOD implementation of the program.

Within the past three or four years, influences outside the program have generated an active interest in contracting for services. Political actions have reduced the number of authorized federal employees, or in budget vernacular, "civilian personnel ceilings;" and, problems of retention have made it difficult to fill authorized military billets. It has become necessary to consider contracting as a method of balancing skills and maintaining needed services.

A 1977 study group for the Chief of Naval Operations (CNO), chartered to find ways of improving economy and efficiency in the shore establishment, identified several areas where the Navy should consider civilianization of military billets, either through use of in-house civilians or contract. Based on a report of potential conversion studies, fiscal year 1979 through 1981 budget decisions directed contracting-out. Authorized civilian ceilings were reduced while funding for conversion to contract was provided. This gave major claimants strong incentive toward proceeding with the CITA program and other contracting efforts.

The OMB memorandum transmitting the revised Circular A-76 stated that while it is clearly specified in A-76 that agencies will not contract out solely to meet personnel ceilings, it is also equally clear that agencies will contract out when justified under the circular regardless of the relationship between personnel levels and authorized ceilings.

One important requirement

Even though Circular A-76 states that we should not contract out solely to overcome personnel limitations, Congress did not feel the distinction was clear enough and prohibited conversion to contract within the Department of the Defense. This moratorium was lifted in 1979, but the 1979 Defense Authorization Act required an announcement of proposed conversion studies before studies could commence.

The "announcement" constitutes notification of Congress, employees, commercial vendors, and labor unions (as well as their respective lawyers), that a conversion to contract is under consideration. It identifies the CITA by function, location, and number of in-house personnel involved. Section 806 of the 1980 Act specifically prohibited the use of contracting to circumvent any civilian personnel ceiling, and required various notification and reports, the most noteworthy being certification that the government in-house calculation is based on the *most efficient and cost effective in-house organization*. This requirement may well be the most important and worthwhile aspect of the program.

Program procedures

In the other armed services, efficiencies have resulted from the application of this logical requirement. In the Navy, there is insufficient data on which to base any statistics concerning similar management improvements. If properly implemented, this requirement should give employees an opportunity to perfect their function before it is subjected to economic analysis. In 1980, Congress established the requirements of Section 806 as permanent law. These requirements can be found in section 502 of Public Law 96-342, the Department of Defense Authorization Act for 1981.

Within the Navy and the Office of the Secretary of Defense, administrative problems have created additional impediments to the use of contracting as a resource management alternative. It took nearly a year for the office of Secretary of Defense (OSD) to prepare and publish new directives following the March 1979 transmittal of the revised Circular A-76. Then the American Federation of Government Employees (AFGE) exercised its ninety-day review option — so fiscal year 1980 was more than half over before DOD activities could begin conducting studies under the new cost comparison handbook procedures. The complexity of the handbook cost calculation, limited expertise, and lack of standardized audit procedures have slowed study efforts. The vast majority of the studies announced in March 1979 are still pending.

The procedures of the program are contract oriented. The directed logic applied at nearly every decision point favors contracting. But, at the same time, the restrictions and approval steps, intended to ensure national defense, protect government employees and satisfy other special interests, se-

(Continued from preceeding page)
verely restrict conversions to contract. Acquiring service contracts, within the rules of Circular A-76, Congressional legislation and in-house administrative requirements, has not resulted in the anticipated solution to personnel shortages.

A lack of performance data makes it difficult to predict whether increased and extensive use of service contracts is good for the Navy. Successful service contracts do exist. The total base operations support contract at the strategic Submarine Base, Bangor, Wash., appears to be a highly successful operation, although, it may be somewhat of a glass house operation. The base support contract for operation of the USAF Eastern Test Range, including Cape Canaveral and Kennedy Space Center, boasts 34 years of success. There are many other, less known, successful service contracts.

The Chief of Naval Education and Training (CNET) has recognized the problems inherent in acquiring and managing a multitude of individual service contracts. Our efforts will be toward grouping and establishment of multi-function contracts. Two so-called BOS (base operating support) contract studies are already underway within the training command. (For additional reading see "Base Operating Support Services Contracting," by Capt. C. J. Gibowicz, Jr., *The Navy Civil Engineer* Summer/Fall 1979, Vol. XX No. 1.)

Guidance on the way

The prevalent dissatisfaction with service contracts can be attributed in part to poor administration by the Navy. Wherever a successful service contract exists, there also exists good day-to-day administration by government agents, and a good working relationship between the contractor's representative and the Commanding Officer's Technical Representative (COTR). (The use of "commanding officer" vice "contracting officer" is intentional.) This is an area which requires more attention. Training for those dealing with contractors and receiving services via contract is needed. It isn't enough to write a good spec, use the best type of contract, and negotiate a good price. This won't ensure good performance. Many circumstances, unanticipated or beyond our control, require day-to-day liaison, management, and administration.

To emphasize importance, alleviate the shortage of manpower and expertise, and improve support of contract conversion studies, a CNET "CITA" Detachment has been established. When fully manned, the "CITA-DET" will have regional offices capable of providing CNET activities expert guidance, assistance, and procedural standardization relating to conversion studies.

Outcome questionable

Insofar as the CITA program, per se, is concerned, program requirements have become an impediment to traditional and necessary resource management procedures. Contradictory messages are being imagined at the claimant level. While directives and resource allocation documents call for conversions to contract, the procedures, administration, and politics of the CITA program seem to preclude compliance.

The Naval Audit Service, General Accounting Office (GAO), and the CNO have all recommended contracting for various training and training support functions. CITA program procedures have made it difficult to comply. Programming and budgeting are complicated procedures; and, uncertainty such as that created by the CITA program makes the job even more complex.

Contracting offers a third source of manpower; but, must be approached in a rational, logical and methodical manner in order to maintain an acceptable balance. Coordination with long-range planning for procurement or modification of facilities is important (e.g., construction of a larger mess hall may not be required if many military billets are converted to contract).

The requirements which are in effect to protect our loyal and dedicated employees are well founded; however, the program has created concern and reduced morale among employees. The delays which are intrinsic in the program not only create difficulty in the programming and budgeting sense, but also in personnel and personal management.

A big problem is how to manage a function under study when incumbent employees start finding jobs elsewhere. The uncertainties of various approval requirements, audits, small and minority business considerations and the final cost comparison make it impossible to anticipate the results of a CITA study.

There is no way to plan for the eventual outcome. This makes it tough for the affected employees as well as management. Personnel assets and personal lives would be much easier to manage if there were no CITA program. (The reader should remember, this is a controversial subject.)

On the positive side, improved organization and management of in-house operations can result from compliance with section 502 requirements, and in the long run, standardization, stability and economies should result, which benefit employees, management, and the taxpayer.

Not the ultimate solution

Service contracting is not a matter of choice. It is required by OMB Circular A-76 and by limitations on in-house manpower. The CITA program is complex and political, almost to the point of preventing contracting. Budget cuts in personnel ceiling, levied in anticipation of study results, must be reasonable. Contracting is not the ultimate solution to a reduced federal employment profile; productivity improvement methods must also be implemented. Legislation passed relative to the CITA program has potential for creating improvements in in-house efficiency.

A matter of survival

Contracting actions which are though to be in the best interests of the Navy cannot be assured within the constraints of the CITA program. For that matter, the reverse is also true. Contrary to what many believe, there are many highly successful contracting out efforts in the Department of Defense. Manpower shortages, primarily military, and the complexity and slow tempo of the CITA program have created an urgency, within resources management, for increased productivity, easing of ceiling limitations or reduction in tasking. Development of this third source of manpower may well be a matter of survival. □

NAVAL SCHOOL, CIVIL ENGINEER CORPS OFFICERS
SCHEDULE OF COURSE OFFERINGS
DATES AND LOCATIONS

- AIR INSTALLATIONS COMPATIBLE USE ZONES SEMINAR (A-4A-0035)
  - #25 10-11 June 1981 — West Coast*
  - #26 7-8 October 1981 — East Coast*

- CIVIL ENGINEER CORPS OFFICER--BASIC QUALIFICATION (A-4A-0010)
  - #159 9 April-5 June 1981 — Port Hueneme
  - #160 23 July-18 September 1981 — Port Hueneme
  - #161 22 October-18 December 1981 — Port Hueneme

- CONSTRUCTION BATTALION OPERATIONS (A-4A-0033)
  - #22 18-29 May 1981 — Port Hueneme
  - #23 31 August-11 September 1981 — Port Hueneme
  - #24 30 November-11 December 1981 — Port Hueneme

- CONSTRUCTION CONTRACT ADMINISTRATION AND MANAGEMENT (A-4A-0032)
  - #43 18-29 May 1981 — Port Hueneme
  - #44 22 June-2 July 1981 — Honolulu, HI
  - #45 20-31 July 1981 — Port Hueneme
  - #46 31 August-11 September 1981 — Port Hueneme
  - #47 30 November-11 December 1981 — Port Hueneme

- CONSTRUCTION CONTRACT MODIFICATIONS (A-4A-0023)
  - #39 11-15 May 1981 — Port Hueneme

- ECONOMIC ANALYSIS (A-4A-0020)
  - #44 29 June-3 July 1981 — Honolulu, HI
  - #45 21-25 September 1981 — Port Hueneme
  - #46 14-18 December 1981 — Port Hueneme

- ENERGY MANAGEMENT (A-4A-0037)
  - #22 28 April-1 May 1981 — Philadelphia
  - #23 4-7 August 1981 — South Coast*
  - #24 3-6 November 1981 — West Coast*

- ENVIRONMENTAL PROTECTION (A-4A-0036)
  - #22 5-8 May 1981 — Philadelphia
  - #23 11-14 August 1981 — South Coast*
  - #24 27-30 October 1981 — West Coast*

- MILITARY JUSTICE/MILITARY PERSONNEL ADMINISTRATION CIVIL ENGINEER CORPS OFFICERS (A-4A-0024)
  - #53 11-15 May 1981 — Port Hueneme
  - #54 24-28 August 1981 — Port Hueneme
  - #55 23-27 November 1981 — Port Hueneme

- NAVY INDUSTRIAL FUND (A-4A-0018)
  - #78 17-21 August 1981 — Port Hueneme

- PLANNING AND REAL ESTATE (A-4A-0040)
  - #10 3-7 August 1981 — East Coast*

- PROSPECTIVE COMMANDING OFFICER/EXECUTIVE OFFICER CONSTRUCTION BATTALION (A-4A-0030)
  - #11 9-11 June 1981 — Port Hueneme

- PUBLIC WORKS CENTER MANAGEMENT FOR PROSPECTIVE COMMANDING OFFICERS AND EXECUTIVE OFFICERS (A-4A-0043)
  - #4 8-12 June 1981 — Port Hueneme

- PUBLIC WORKS MANAGEMENT (A-4A-0031)
  - #29 18-29 May 1981 — Port Hueneme
  - #30 22 June-2 July 1981 — Honolulu, HI
  - #31 20-31 July 1981 — Port Hueneme
  - #32 31 August-11 September 1981 — Port Hueneme
  - #33 30 November-11 December 1981 — Port Hueneme

- SEABEE CHIEF PETTY OFFICER MANAGEMENT (A-710-0021)
  - #28 27 April-5 June 1981 — Port Hueneme
  - #29 10 August-18 September 1981 — Port Hueneme
  - #30 9 November-18 December 1981 — Port Hueneme

- SEABEE SENIOR/MASTER CHIEF PETTY OFFICER MANAGEMENT (A-710-0016)
  - #27 29 June-10 July 1981 — Port Hueneme

- SEABEE CONSTRUCTION MANAGEMENT (A-4A-0034)
  - #35 27 April-1 May 1981 — Port Hueneme
  - #36 29 June-3 July 1981 — Gulfport, MS
  - #37 10-14 August 1981 — Port Hueneme
  - #38 2-6 November 1981 — Gulfport, MS
  - #39 7-11 December 1981 — Port Hueneme

- SEABEE MILITARY TRAINING (A-4A-0046)
  - #5 4-9 May 1981 — Port Hueneme
  - #6 17-22 August 1981 — Port Hueneme
  - #7 16-21 November 1981 — Port Hueneme

- SERVICE CONTRACTS (A-4A-0045)
  - #15 13-17 April 1981 — Bellmawr, NJ
  - #16 20-24 April 1981 — Washington, DC
  - #17 15-19 June 1981 — Honolulu, HI
  - #18 10-14 August 1981 — Port Hueneme
  - #19 26-30 October 1981 — Norfolk, VA
  - #20 2-6 November 1981 — Charleston, SC

- SHORE FACILITIES PLANNING SYSTEM (A-4A-0016)
  - #50A 27 April-1 May 1981 — Port Hueneme
  - #51 22-26 June 1981 — Honolulu, HI
  - #52 14-18 September 1981 — Port Hueneme
  - #53 7-11 December 1981 — Port Hueneme

- SPECIAL PROJECTS SEMINAR (A-4A-0048)
  - #5 1-2 June 1981 — Port Hueneme
  - #6 21-22 September 1981 — Port Hueneme
  - #7 14-15 December 1981 — Port Hueneme

*Exact location to be announced at later date.

ICELAND

By LCDR and Mrs. THOMAS J. TANNER, CEC, USN
P.E., Calif.

Iceland, the land of ice, fire, northern lights, and midnight sun . . . it is a land of contrasts, challenges, and endless variety . . . for us it was to be our most memorable Naval tour.

Iceland is a country of 40,000 square miles with a population of 210,000. Icelanders are justifiably proud of their heritage for they have a democratic form of government and a parliament which dates from 930 A.D.

Their president is Vigdis Finnbogadottir, the world's first popularly elected femal head of state! It is America's nearest European neighbor, a beautiful, rugged island. The terrain is ever-changing and a photographer's dream. Glaciers can be found in Iceland but they are only part of the intriguing landscape. Iceland is indeed misnamed although bordering the Arctic circle, the temperatures are generally between 30°F and 50°F.

The NATO base, on which all U.S. servicemen must live, is in Keflavik on the southwest corner of the island. Base housing is generally considered adequate to good. Most quarters are 2, 3, or 4 bedrooms. The Navy Exchange is large and usually stocks most necessary items as well as collectables from other countries.

Recreational facilities available on the base include an indoor pool, complete gym, weight room, racquetball courts, baseball diamonds and hobby and craft shops for leather working, tape duplicating, lapidary and a photographic laboratory.

A youth center, child care center and two schools provide recreation and education for the dependents. There are also many organized groups which include square dancing, 4-wheel-drive enthusiasts, choirs and thespians.

The Officer's Club is the locale for many social events from the Octoberfest (with food and beverage imported direct from Germany) to the monthly Hail and Bless parties. Classes are frequent and varied. It is possible to obtain a graduate degree or to sharpen your skills in breadmaking, knitting, painting, photography, gourmet cooking, needlework, pottery, beginning Icelandic—the list is intriguing.

There are ten CEC billets in Iceland: six public works department billets, three ROICC billets, and one Staff Civil Engineer billet. The backbone of the Public Works Department is the 350 Icelandic employees and 70 Seabees who provide the full range of public works services: maintenance, transportation, utilities, engineering, planning and family housing. The CEC jobs provide a continuous stream of professional challenges as exemplified by the multi-million dollar venture which will provide geothermal heat to the NATO base.

Reykjavik, the capital, is approximately one hour away by paved road. It is in Reykjavik that the European flavor appears. The shops are small, unique and often expensive. Goods from Sweden, Denmark, Spain, Norway and Italy are most readily available. Reykjavik is a colorful blend of old and new, home to the National Symphony Orchestra, National Theatre, and a geothermal heated outdoor pool. The restaurants in Reykjavik are quite good. Specialities include Icelandic lamb and freshly-caught *ysa* (Icelandic cod).

Museums and galleries abound in Iceland. A syning, or showing, occurs frequently. While we were there, works ranging from Picasso to the original Sagas were presented. The National Museum houses a permanent collection as well as featured works.

One of our greatest pleasures was in getting to know the Icelandic people. We found them warm and friendly with a flair for independence and pride. They welcomed us to their land and made us feel we were a part of it. We developed a strong appreciation for the Icelandic heritage. One January evening we were guests at a traditional Thorrablot which is a celebration of the rising of the sun

. . . Dear Folks: Last edition we told you of tropical island assignments in the Trust Territories . . . now, we tell you of an extremely different locale for a Civil Engineer Corps assignment . . .

after winter months of little light. We savored ripened shark, singed sheep's head, whale blubber, ram's testicles, Icelandic potatoes, smoked lamb, blood sausage and brennivin, a beverage appropriately called Black Death.

We weathered condition *Charlie*, which is a combination of snow and wind resulting in a virtual white-out. During one *Charlie*, while a large portion of the Public Works Department was involved with snow and ice control, several of our Icelandic friends were stranded on base and spent the night in our quarters. Warm hospitality is an Icelandic tradition.

Summer is the time for outings, the days are long and the unpaved roads are graded to afford passage to many unforgettable sights. We spent a delightful day at the summer home of some of our Icelandic friends on the edge of Thingvellir Lake. Another day our family was given a tour of Gulfoss, Europe's largest waterfall; Geysir, the namesake for geysers the world over, and many of western Iceland's beautiful sights.

A day trip to the Westman Islands allowed us to see the still-smoldering lava from the 1973 eruption that buried over 400 homes on the island of Heimaey. The ground is hot enough still to ignite a piece of paper. Following tradition, our boys released baby puffins into the ocean surf. Hekla, one of Iceland's most famous volcanoes, erupted shortly before we left Iceland, providing us an opportunity to witness and feel a volcanic eruption.

Our automobile served us well, allowing us frequent travel. We visited original sod dwellings, climbed into volcanic craters, wandered rolling green hills and fields covered with tundra. We also visited glaciers, natural hot rivers and pools, and watched the sun set over the ocean with only the squall of gulls and arctic terns for company.

During the summer months we spent several weekends at a working Icelandic farm leased by the Navy base. The boys played in the barn and nearby sod hut. Hiking, fishing, duck hunting, or riding the spirited Icelandic horses filled the days and gave us a feeling for life in this country of farmers and fishermen.

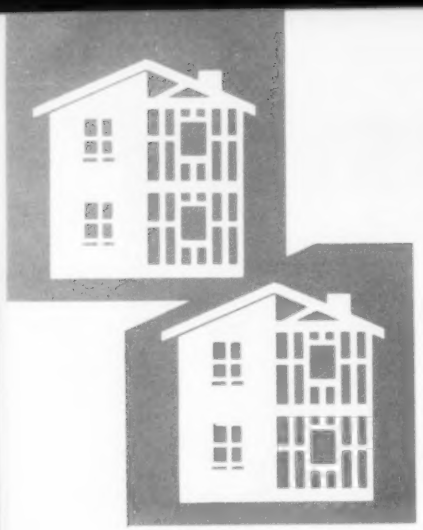
Tent camping was a first for us in Iceland. We may well have spent the entire weekend trying to get our rented tent up without an Icelander's assistance. Our boys picked wild blueberries and played freely with the Icelandic children, not letting language be a barrier. Another evening was spent in a rustic lodge singing folk songs in Icelandic to the accompaniment of a guitar while gale force winds whipped the rain outside.

Vacationing *from* Iceland was an additional adventure. We made six trips to Europe, including one of 28 days during which we used a Eurorail Pass to see Italy, Austria, France, and Germany. The boys traveled with us to the sunny beaches of Spain and to Germany, especially enjoying Hitler's Eagle Nest and a German festival. We returned from Copenhagen, Denmark, with blue noses.

Christmas is a special time in Iceland, observed with beautiful decorations, pine trees and gaiety. We shared some of the festivities with one family at their home; the ring-around-the-tree dance and bountiful table will always be remembered with fondness.

The Icelandic language and salmon proved illusive; we neither caught a salmon nor mastered the language, but we enjoyed the challenge both presented. Icelanders are generally fluent in English and are most tolerant and appreciative of any attempts at Icelandic by Americans.

The weather and wind are continually changing and can be formidable, but with a warm parka and optimism both can be tolorated. During our two years we formed friendships that we hope will last a lifetime and learned to respect and love the fascinating country called Iceland and her people. □



Energy Conscious Architectural Detailing

By VINCENT M. SPAULDING
R.A., Va.

•Alexandria, Va.

As an architect designs a building, there are many considerations which should offer many opportunities to save energy. The design of architectural details is increasingly important due to demands for conservation. Energy conscious detailing conserves heating and cooling through improved thermal performance and by reducing short circuits.

Two areas of major concern as an architect selects materials and designs details for a building are the thermal mass and the thermal barrier concepts. Both will reflect upon the building's thermal performance and the power consumption of the HVAC (heating, ventilating and air conditioning) system.

Materials which have the ability to absorb and re-radiate large amounts of energy are considered thermal mass materials. Concrete and concrete masonry are primary examples of materials possessing thermal mass. When thermal mass is placed in a building, the peak temperature experienced is reduced and delayed. These two effects are called damping and time-lag.

Damping reduces the peak heat load experienced and results in smaller HVAC equipment at less initial cost. The time-lag factor delays the time that a space experiences the peak temperature. In some climates, this allows the space to be warmed by the heat stored in the mass long after the sun has set and the ambient temperature has dropped.

As a building is detailed, time-lag can be achieved by conventional construction systems using heavy load-bearing walls constructed of concreate, unit masonry, stone, and other similar materials. Materials possessing high thermal mass are generally cost effective in that they simultaneously provide supporting structure, definition of spaces, acoustical separation, and thermal storage.

Another method of using thermal mass in a building is to place a material possessing thermal mass directly behind a south or west facing glazed wall. This provides ideal heat storage capability in conjunction with a substantial time delay that moderates the peak heating loads.

The use of thermal mass is becoming a major factor in reducing energy consumption and has been accounted for in heating and cooling calculations contained in the 1977 fundamentals volume of the ASHRAE Handbook and Product Directory by a technique called the Response Factor Method which evaluates the heat conducted through multilayer building elements under transient (nonsteady and nonsteady periodic) exposure conditions.

The design and placement of resistive insulation (or the thermal barrier) is critical to the amount of power a building consumes. The three main components of a building envelope are the foundation, walls, and roof. Weatherstrippinng, caulking, and windows and doors are subcomponents of the building envelope and are particularly energy intensive. A general rule for thermal barrier design in all of these areas of the building envelope is to keep the insulation continuous.

There are many different locations for providing foundation insulation, referred to later as perimeter insulation. Most typically, perimeter insulation is to be provided on the interior side of perimeter foundation walls that are backfilled or placed horizontally under slabs on grade. Perimeter insulation should be detailed with special attention given to insulating the edge of concrete slabs to prevent thermal gaps within the building envelope. Perimeter insulation placed vertically should extend below the frost line, and perimeter insulation placed horizontally should extend in from the exterior wall a distance of at least 2 feet.

The walls of a multi-story structure can create a problem in providing a continuous thermal barrier. Multi-story buildings sometimes have thermal gaps at the floor levels because of the detailing of the wall sections. There are a number of methods to achieve a continuous thermal barrier in the walls of a multi-story building and also achieve the proper placement of the insulation near the exterior.

Typical detailing techniques include adjusting the edge of floor slabs supported by masonry cavity wall construction to allow the insulation in the cavity to extend continuously or by extending wall insulation to the underside of floor decking in framed wall construction. When cellular plastic insulation materials are used for wall insulation, special precautions should be taken in the development of details to insure that the insulation materials are covered with an approved thermal barrier material that will provide protection from a fire inside the building.

With the advent of the energy shortage, the need for more and better roof insulation has drastically increased. Traditional roof insulation

materials, such as perlite board and vegetable or wood fiber board require installations at thicknesses up to 6 inches to meet requirements for more thermally efficient roof construction assemblies. The increased insulation thicknesses require the use of additional wood blocking for gravel stops, curbs, vents, parapets, expansion joints, etc., to allow for proper installation of flashing and built-up roofing membrane. More blocking and curbing materials create difficulty in using standard wood sizes, and preassembled metal flashing components.

The additional blocking also increases the weight of the roof construction assembly, particularly if the slope of the roof requires wood blocking for anchoring roof insulation. Problems are also experienced in establishing the proper height of base flashing which is essential to proper built-up roofing performance.

Efforts to alleviate or reduce the problems associated with the use of traditional roof insulation materials have led to increased interest in the use of more thermally efficient cellular plastic roof insulation materials, such as polyurethane board. Cellular plastic materials are lightweight, versatile, structurally stong, and easily installed.

However, there are ceertain fire hazards associated with the use of cellular plastic insulation materials that should be considered during the design of details to allow for their use, such as: spread flame more rapidly and increase the likelihood of "flashover" in fire situations, generate extreme heat more quickly, produce greater amounts of dense smoke, and release toxic or flammable gases or chemicals more quickly.

The attention that is given to the design of details indicating how cellular plastic insulation materials should be used in a building system ultimately determines their fire safety. Over concrete, poured gypsum, 2-inch thick tongue-and-groove wood roof decks, or Factory Mutual rated noncombustible precast roof deck panels or planks, cellular plastic insulation with an Underwriter's Laboratories Class A, B, or C rated roof covering material normally does not add to a fire hazard in the interior of the building.

Over bare metal decks, a fire-rated underlayment of perlite board, gypsum board or other approved thermal barrier materials should be indicated to be applied between the cellular plastic insulation and the deck to provide protection from fire inside the building.

If the problems associated with providing increased amounts of roof insulation are recognized and properly evaluated during the development of roofing details, the problems will be minimized and the building owner will benefit through ownership of a roof assembly which will provide improved thermal performance without increased roofing performance problems.

Much of the thermal advantage gained through the use of thermal mass and resistive insulation can be lost through indiscriminate use of unnecessarily large glass areas or poor architectural details that allow excessive heat transfer by air infiltration.

Air infiltration around windows and doors can largely offset the benefits of a wall with a low coefficient of heat transmission. Weatherstripping should therefore be provided for keeping the infiltration losses to a minimum. The two generic types of weatherstripping are compression and interlocking type. The three common materials used in weatherstripping are metal (brass, zinc, bronze, stainless steel, aluminum), vinyl and neoprene.

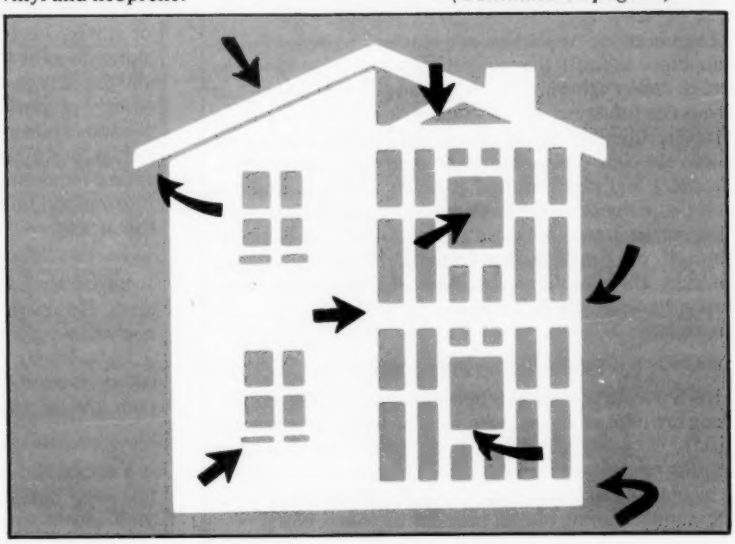
Interlocking and spring metal compression weatherstripping are more difficult to install and generally do not seal the corners of doors and windows as well as neoprene compression type weatherstripping. Therefore, neoprene compression weatherstripping should be detailed where practical.

Care must be taken not to use neoprene weatherstripping on door sills where excessive traffic will damage it. Architectural Graphic Standards has several pages of suggested weatherstripping details for doors and windows.

Good weatherstripping takes care of the operable windows and doors; however, other areas where infiltration occurs include: joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames; joints between new and existing exterior walls; expansion and control joints; openings where items pass through exterior walls; and metal-to-metal joints in exterior walls. These joints should be filled with an elastomeric type sealing compound, commonly referred to as a "sealant."

At exterior wall penetrations, sealing compound should be indicated to be applied at both exterior and interior surfaces of wall. Sealing compounds are formulated to be non-drying, non-hardening, and

(Continued on page 30)



A Primer For Professional Registration

Compiled by
LCDR DENNIS LEE, CEC, USNR
CECOS Faculty

Professional registration as an engineer or architect normally involves three steps of accomplishment.

Application. Application forms are obtained from the individual state or states in which registration is desired. Education and work experience data and "good character" recommendations by Registered Professional Engineers are required. Most senior CEC officers are registered and should be the character reference required. Filing fees normally range from $25 to $60.

Experience. State registration boards usually consider responsible CEC billets as qualifying experience. Any registered senior CEC officer in your chain of command at a NAVFAC activity may be used. Should you report to a line officer, a registered senior CEC officer who has first-hand knowledge of your work may be listed as a reference. Generally, college education plus experience must total six to eight years, depending upon the state of registry. Eliminate Navy abbreviations and acronyms from your statement of experience — make it understandable from a non-military point of view!

Examination. Applicants are required to pass two examinations to fulfill the requirements for registration as a professional engineer. The first exam is eight hours and covers the fundamentals of engineering. Many engineers complete this exam before college graduation. The second is also an eight-hour examination covering engineering principles and practices and is taken when an engineer meets experience requirements of the registering state. Forty-seven states now use the standardized National Council of Engineering Examiners Examinations (NCEE). The exceptions are Illinois, Colorado, and New Jersey; however, the EIT exam is under NCEE format in these states.

Examination Preparation

Review courses are the best preparation for exams. Many are offered by colleges or professional societies at night or on weekends. Not only do they review the material, but recommend authoritative references. Depending on availability of funds, the Tuition Aid Program or your command's training budget may defray course costs.

Examinations should be taken within the state for which you have prepared.

Recent college graduates should undertake the EIT examination as soon as possible after settling down in a career specialty. Taking the Professional Engineer exam concurrently with an engineering post graduate program is particularly recommended.

Obtain copies of prior exams from the State Board of Registration where you plan to take the exam.

Solve practice problems for speed and confidence. Don't fall into the trap of merely reading texts and agreeing with what you see.

Take as many books to the exam as you need. But you must be thoroughly familiar with the contents. There is not enough time to search out material. It further helps to use books you used in school. The familiar reference may turn an hour problem into a five-minute solution.

Place of Registration

Candidates for registration apply to the individual state or states. Legislative differences in standards between states do exist but are becoming less critical. Applicants should consider advantages of location, the existence of nearby preparation courses, the match of their backgrounds against the particular requirements of a state, potential for reciprocity, future likelihood of continuing education requirements, and other licensing trends. General information on state boards is listed at the conclusion of this article.

Examination Dates

Registration exams are normally given in April and October. However, some states offer the Professional Engineer exam only once a year.

For calendar year 1981, the exam dates which have been set aside are 9-11 April and 29-31 October. Check with your state of registry for exact date.

Sources

You can find more information than you will need. The following publications exemplify some of the references available.

Reference Material

Professional Engineer

Constance, John D. *Electrical Engineering for Professional Engineers' Examinations.* 3d ed. McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, NY 10020. 1975. 537 pp. $24.50.

Constance, John D. *Mechanical Engineering for Professional Engineers' Examinations.* 3d ed. McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, NY 10020 1978. 492 pp. $24.50.

National Council of Engineering Examiners (NCEE). *Professional Engineering Examinations,* Vol. I (1965-1971). P.O. Box 5000, Seneca, SC 29678. 412 pp. $16.50.

NCEE *Solutions: Professional Engineering Examinations,* Vol. II (1965-1971). P.O. Box 5000, Seneca, SC 29678. 960 pp. $33.50 (Vols. I and II $47.50).

NCEE. *Professional Engineering Examinations,* Vol. III (1972-1976). P.O. Box 5000, Seneca, SC 29678. $8.95.

Newnan, Donald G. *Civil Engineering License Review.* 8th ed. Engineering Press, Box 5, San Jose, CA 95103. 1980. 314 pp. $16.95.

Jones, Lincoln D. and Newnan, Donald G. *Electrical Engineering License Review.* 5th ed. Engineering Press, Box 5, San Jose, CA 95103. 1980. 282 pp. Paperback $16.95.

Kurtz, Max. *Engineering Economics for Professional Engineers' Examinations.* 2d ed. McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, NY 10020. 1975. 311 pp. $34.50.

Lindeburg, Michael R. *Civil Engineering Review Manual; a complete review course for the P.E. examination for civil engineers.* 2d ed. Professional Engineering Institute, P.O. Box 639 (Dept. 93C), San Carlos, CA 94070. c1980. $29.00.

Pefley, Richard K. and Newnan, Donald G. *Mechanical Engineering License Review.* 3d ed. Engineering Press, Box 5, San Jose, CA 95103. 1980. 376 pp. Paperback $16.95.

Engineer-in-Training

U.S. Army Engineer School. *Professional Engineer Study Materials.* A series of 18 booklets to provide review of engineering fundamentals at E.I.T. and P.E. levels. Available to qualified members of the Armed Forces of the U.S. and employees of any government agency or department. Address requests for information to
The Commandant
U.S. Army Engineer School
Attn: ATZA-DTR (Individual Training Section)
Fort Belvoir, VA 22060. Material is not available for general distribution.

National Council of Engineering Examiners. *Typical Questions—Fundamentals of Engineering* brochure. P.O. Box 5000, Seneca, SC 29678. $1.00 (Sample questions relating to Fundamentals of Engineering exam.)

Newnan, C. Dean. *Engineering-in-Training License Review.* 8th ed. Engineering Press, Box 5, San Jose, CA 95103. 1976. 256 pp. $11.95.

Newnan, Donald G. and Larock, Bruce E. *Engineering Fundamentals: Examination Review.* 2d ed. John Wiley & Sons, 605 Third Avenue, New York, NY 10016. 1978. 503 pp. $27.50.

Lindeburg, Michael R. *Engineer-in-Training Review Manual.* Professional Engineering Institute, P.O. Box 639, (Dept 93C), San Carlos, CA 94070.

Morrison, James Warner. *Engineering Fundamentals.* Arco Pub. Co., 219 Park Ave., S., New York, NY 10003. 1978. $10.00.

It is suggested that local universities and state chapters of the National Society of Professional Engineers be contacted for information concerning review courses which may be available.

For architects pursuing registration, consult NAVFAC INST 1520.8 and 12400.10B. □

State Registration Boards

ALABAMA: State Board of Registration for Professional Engineers and Land Surveyors, Suite 212, 750 Washington Avenue, Montgomery 36130. Tel: (205) 832-6100.

ALASKA: State Board of Registration for Architects, Engineers and Land Surveyors, Mail: Pouch D (State Office Building, 9th Floor), Juneau 99811. Tel: (907) 465-2540.

ARIZONA: State Board of Technical Registration, 1645 W. Jefferson Street, Suite 315, Phoenix 85007. Tel: (602) 255-4053.

ARKANSAS: State Board of Registration for Professional Engineers and Land Surveyors, P.O. Box 2541, 1818 W. Capitol, Little Rock 72203. Tel: (501) 371-2517.

CALIFORNIA: Board of Registration for Professional Engineers, 1006 Fourth Street, 6th Floor, Sacramento 95814. Tel: (916) 445-5544.

COLORADO: State Board of Registration for Professional Engineers and Land Surveyors, 600-B State Services Building, 1525 Sherman Street, Denver 80203. Tel: (303) 839-2396.

CONNECTICUT: Board of Registration for Professional Engineers and Land Surveyors, 20 Grand Street, Dept. of Consumer Protection, Div. of Licensing and Registration, Hartford 06106. Tel: (203) 566-3386.

DELAWARE: Delaware Association of Professional Engineers, 2005 Concord Pike, Wilmington 19803. Tel: (302) 656-7311.

DISTRICT OF COLUMBIA: Board of Registration for Professional Engineers, 614 H St., N.W., Room 109, Washington 20001. Tel: (202) 727-3673.

FLORIDA: State Board of Professional Engineers, Ambassador Building, Suites 220 & 221, 2009 Apalachee Parkway, Tallahassee 32301. Tel: (904) 488-9630.

GEORGIA: State Board of Registration for Professional Engineers and Land Surveyors, 1800 Peachtree Street, N.W. Suite 615, Atlanta 30309. Tel: (404) 656-3926.

GUAM: Territorial Board of Registration for Professional Engineers, Architects and Land Surveyors, Department of Public Works, Government of Guam, P.O. Box 2950, Agana 96910. Tel: 646-8643. (From U.S. ask for operator assistance.)

HAWAII: State Board of Registration for Professional Engineers, Architects, Land Surveyors and Landscape Architects, P.O. Box 3469, (1010 Richards St.) Honolulu 96801. Tel: (808) 548-3086.

IDAHO: Board of Professional Engineers and Land Surveyors, 842 La Cassia Drive, Boise 83705. Tel: (208) 334-3860.

ILLINOIS: Department of Registration and Education, Professional Engineers' Examining Committee, 320 W. Washington Street, Springfield 62786. Tel: (217) 785-0800.

INDIANA: State Board of Registration for Professional Engineers and Land Surveyors, 1021 State Office Building, 100 N. Senate Avenue, Indianapolis 46204. Tel: (317) 232-1840.

IOWA: State Board of Engineering Examiners, State Capitol Complex, Des Moines 50319. Tel: (515) 281-5602.

KANSAS: State Board of Technical Professions, 535 Kansas Avenue, Suite 1105, Topeka 66603. Tel: (913) 296-3053.

KENTUCKY: State Board of Registration for Professional Engineers and Land Surveyors, P.O. Box 612, (Rt. 3, Millville Rd.), Frankfort 40602. Tel: (502) 564-2680.

LOUISIANA: State Board of Registration for Professional Engineers and Land Surveyors, 1055 St. Charles Avenue, Suite 415, New Orleans 70130. Tel: (504) 581-7938.

MAINE: State Board of Registration for Professional Engineers, State House, Augusta 04333. Tel: (207) 289-3236.

Professional Registration

MARYLAND: State Board of Registration for Professional Engineers, 1 South Calvert Street, Room 802, Baltimore 21202. Tel: (301) 659-6322.
MASSACHUSETTS: State Board of Registration of Professional Engineers and of Land Surveyors, Room 1512 Leverett Saltonstall Bldg, 100 Cambridge St., Boston 02202. Tel: (617) 727-3088.
MICHIGAN: Board of Registration for Professional Engineers, P.O. Box 30018, (808 Southland), Lansing 48909. Tel: (517) 373-3880.
MINNESOTA: State Board of Registration for Architects, Engineers, Land Surveyors and Landscape Architects, 5th Floor, Metro Square, St. Paul 55101. Tel: (612) 296-2388.
MISSISSIPPI: State Board of Registration for Professsional Engineers and Land Surveyors, P.O. Box 3, (200 S. President St., Suite 516), Jackson 39205. Tel: (601) 354-7241.
MISSOURI: Board of Architects, Professional Engineers and Land Surveyors, P.O. Box 184, (3523 North Ten Mile Drive) Jefferson City 65102. Tel: (314) 751-2334.
MONTANA: State Board of Professional Engineers and Land Surveyors, LaLonde Building, Helena 59601. Tel: (406) 449-3737, Ext. 9.
NEBRASKA: State Board of Examiners for Professional Engineers and Architects, P.O. Box 94751, (301 Centennial Mall, South) Lincoln 68509. Tel: (402) 471-2021 or 471-2407.
NEVADA: State Board of Registered Professional Engineers and Land Surveyors, 100 North Arlington Avenue, Mezzanine Floor, Reno 89501. Tel: (702) 329-1955.
NEW HAMPSHIRE: State Board of Registration for Professional Engineers, Room 318, 105 Loudon Road, Concord 03301. Tel: (603) 271-2219.
NEW JERSEY: State Board of Professional Engineers and Land Surveyors, 1100 Raymond Boulevard, Newark 07102. Tel: (201) 648-2660.
NEW MEXICO: State Board of Registration for Professional Engineers and Land Surveyors, P.O. Box 4847, (1505 Llano Street) Santa Fe 87501. Tel: (505) 827-2241.
NEW YORK: State Board for Engineering and Land Surveying, The State Education Department, Cultural Education Center, Madison Avenue, Albany 12230. Tel: (518) 474-3846.
NORTH CAROLINA: Board of Registration for Professional Engineers and Land Surveyors, 3620 Six Forks Road, Raleigh 27609. Tel: (919) 781-9499 or 781-9547.
NORTH DAKOTA: State Board of Registration for Professional Engineers and Land Surveyors, P.O. Box 1264, (1500 C 4th Avenue, N.W.), Minot 58701. Tel: (701) 852-1220.
OHIO: State Board of Registration for Professional Engineers and Surveyors, 65 South Front Street, Room 302, Columbus 43215. Tel: (614) 466-8948.
OKLAHOMA: State Board of Registration for Professional Engipeers and Land Surveyors, Oklahoma Engineering Center, Rm 120, 201 N.E. 27th Street, Oklahoma City 73105. Tel: (405) 521-2874.
OREGON: State Board of Engineering Examiners, Department of Commerce, 4th Floor, Labor and Industries Building, Salem 97310. Tel: (503) 378-4180.
PENNSYLVANIA: State Registration Board for Professional Engineers, Mail: P.O. Box 2649, (Transportation & Safety Bldg., 6th Floor, Commonwealth Avenue & Forester St.) Harrisburg 17120. Tel: (717) 783-7049.
PUERTO RICO: Board of Examiners of Engineers, Architects, and Surveyors, Box 3271, (Tanca Street, 261, Ccmer Tetuan) San Juan 00904. Tel: (809) 724-2387.
RHODE ISLAND: State Board of Registration for Professional Engineers and Land Surveyors, 308 State Office Building, Providence 02903. Tel: (401) 277-2565.
SOUTH CAROLINA: State Board of Engineering Examiners, 2221 Devine St., Suite 422, Columbia 29205. Tel: (803) 758-2855.
SOUTH DAKOTA: State Commission of Engineering and Architectural Examiners, 2040 West Main Street, Suite 212, Rapid City 57701. Tel: (605) 394-2510.
TENNESSEE: State Board of Architectural and Engineering Examiners, 590 Capitol Hill Building, 301 7th Avenue, North, Nashville 37219. Tel: (615) 741-3221.
TEXAS: State Board of Registration for Professional Engineers, 1917 IH 35 South, Mail: P.O. Drawer 18329, Austin 78760. Tel: (512) 475-3141.
UTAH: Representative Committee for Professional Engineers and Land Surveyors, Dept. of Registration, 330 East 4th South Street, Room 210, Salt Lake City 84111. Tel: (801) 533-5711.
VERMONT: State Board of Registration for Professional Engineers, Norwich University, Northfield 05663. Tel: (802) 485-9341.
VIRGINIA: State Board of Architects, Professional Engineers and Land Surveyors, 2 South Ninth Street, Richmond 23219. Tel: (804) 786-8818.
VIRGIN ISLANDS: Board for Architects, Engineers and Land Surveyors, Submarine Base, Mail: P.O. Box 476, St. Thomas 00801. Tel: (809) 774-1301.
WASHINGTON: State Board of Registration for Professional Engineers and Land Surveyors, Mail: P.O. Box 9649, (3rd Floor, Capitol Plaza Bldg.) Olympia 98504. Tel: (206) 753-6966.
WEST VIRGINIA: State Board of Registration for Professional Engineers, 608 Union Bldg., Charleston 25301. Tel: (304) 348-3554.
WISCONSIN: State Examining Board of Architects, Professional Engineers, Designers, and Land Surveyors, 1400 East Washington Avenue,Room 288, Madison 53702. Tel: (608) 266-1397.
WYOMING: State Board of Examining Engineers, Barrett Building, Cheyenne 82002. Tel: (307) 777-7354, or 55/56/57.

Energy Conscious Architecture

(Continued from page 27)

permanently flexible. Joints with as much as 50 percent total movement can be made weatherproof and water tight by the application of sealant. The ability of sealing compounds to extend, recover, compress and recover again, sets them apart from oil and resin base calking compounds that normally only accommodate movement up to ± 2.5 percent of the median joint width.

In the design and detailing of joints to be sealed, provisions should be made for: adequate space and accessiblility for application and tooling of sealant; subsequent inspection and repair; a suitable "back-up" material to control the joint sealant depth and support the sealant, if necessay; and a "bond-breaker" (release material), if necessary, to prevent the sealant from bonding to the back surface of the joint or to the back-up material. (Sealant should bond only to the two opposing joint surfaces.)

To determine proper joint sizes, several sealant manufacturers provide guidance in calculating the total amount of movement which occurs in structural components due to heating and cooling over a selected temperature range. Upon calculating the joint size, the recommendations developed by the sealant industry should be followed in determining the joint width-to-depth ratio of sealant required to properly seal the joint. (The Navy publishes guidance for joint dimensions in NAVFAC guide specification TS-07951, Calking and Sealants.) Technical information developed by manufacturers of sealant materials is also available for assistance in designing and detailing joints to provide resistance to excessive heat transfer by air infiltration.

In cold climates, metal windows that have a thermal barrier material separating the exterior surface of the window from the interior surface should be detailed to reduce the cold interior surfaces of metal windows which are detrimental to thermal comfort and cause condensation problems. Also, due to the impact on the heating and cooling loads imposed on the building by windows, glass areas should be minimized and insulating glass used in lieu of single pane glazing.

The materials and detailing techniques discussed offer numerous opportunitites to conserve energy usage. Detailed analysis of the thermal consequence of varying architectural details by architects is critical to the conservation of nonrenewable energy resources. Materials and assemblies for improved thermal performance of the building envelope are constantly being developed and significantly expand opportunities for energy conservation. Architects designing buildings must be knowledgeable of the thermal characteristics of new as well as traditional building materials and systems, their limitations, and recommended installations. Using every opportunity to conserve energy through material selection and energy conscious architectural detailing will assist in reducing energy consumption at a minimal increase in construction cost. □

A Ready Reserve of Professional Skill

By LCDR W.B. BRITT, CEC, USN
P.E., N.Y.
and LCDR W.A. SMITH, CEC, USNR, *P.E., Colo.*

• *Philadelphia*

The One-Navy spirit of the CEC reserve and active team has been applied to the Navy's efforts for lessened dependence on petroleum products. Participation of the Naval Reserve Engineering Field Division, Northern Detachment 318, Denver, Colo., may lead to Naval Weapons Support Center, (NWSC) Crane, Ind. to become the first Naval installation heating with wood chips as fuel rather than oil.

Visiting the unit in late 1979, Capt. E. R. Oscarson, CEC, USN, Commanding Officer, Northern Division, Naval Facilities Engineering Command (NORTHDIV), suggested an energy conservation feasibility study at NWSC Crane as a potential unit deployment for FEP Unit 318.

NORTHDIV had recently completed a similar study for NAS Brunswick, Me., by contact with the engineering firm of Pope, Evans and Robbins. The NWSC Crane appeared to have adequate forest resources for fueling boilers by wood instead of oil as the replacement of worn-out heating units had already been scheduled.

The engineering study required multi-engineering disciplines. The credentials of the members of the Reserve group were compared with the requirements for such a study, and it was determined that the unit was qualified. Also important, the unit members were enthusiastic and determined to accomplish the assignment. The engineering firm was retained to act as an advisory capacity and to critique the final report. Planning for the project was conducted actively from January until May 1980. The reserve deployment was completed by phasing overlapping teams through NWSC from 12 May through 6 June 1980. The final report was completed in Denver in September 1980.

The study showed a definite economic feasibility of using wood to eliminate or offset current high oil prices. Over 42,000 MBTU are projected to be saved over the 25 year life of the project. Local mill waste at 25 dollars per ton (delivered) will pay back the investment in wood burning equipment. Further, there are estimated to be 75,000 tons per year of sawmill residue within a 50 mile radius of NWSC Crane.

Efforts in forest management onboard NWSC Crane have in the past been directed towards high-market-quality hardwoods rather than fuel woods. The study identified the amount of land that would be required for whole-tree harvesting of cetain species for fuel wood. High-quality hardwood harvests would not be reduced by proposed fuel-wood production.

The technology of wood-burning is rapidly improving and several systems were analyzed and found to be feasible. The most promising of these was found to be a grate burning system that feeds chips to the boiler from silos by gravity and mechanical conveyers.

Coal was considered but not recommended because of costly environmental protection requirements. The required plant of two 500 HP boilers was too small to justify the additional investment.

The heating plants studied are scheduled by the Public Works Department for replacment in FY 81. The total project cost is estimated at $2.3 million.

CDR A. M. Wacker, CEC, USNR, and members of his Reserve unit are typical of Facilities Engineering Program professionals who can provide technical engineering consulting sevices to active forces. □

A Farewell From the Pacific Commander

Challenges of the 80's

Looking back over 32 years of commissioned naval service, I think the present time offers more challenges and excitement to the Civil Engineer Corps than any other time. It is interesting to look back where we have been during those past 32 years and where we may be heading in the future.

Back in the fifties, the CEC officer faced Korea with inadequate shore facilities left over from World Wars I and II. The first management programs utilizing engineering principles and procedures were established in areas of maintenance, utilities and transportation. Convincing the 'old hands' of the advantages of the new management techniques was quite a challenge.

The Seabees were faced with the Herculean job of constructing the Naval Air Station, Cubi Point. The name of the game was — move a mountain — build an airfield. In addition, the Corps was faced with an extensive base construction program in Spain consisting of four major air bases, a naval air station and seven aircraft control and warning sites. The huge construction program called for the establishment of new concepts in construction management.

Then, during the mid-fifties, the Corps undertook the sophisticated construction required for support of the Polais Fleet Ballistic Missile System.

The sixties brought new challenges to our Corps and its officers. Establishment of public works centers and the development and installation of PWC management systems were some of the big tasks which were accomplished. Then came Vietnam, where the Corps went from 1752 to 2200 officers; from 10 to 21 naval mobile construction battalions; and Seabee teams were formed. We quickly became experts not only in military engineering but also in managing a $2 billion construction program using contractor labor in a war zone.

The late sixties also brought great emphasis on the improvement of personnel support facilities — the result was a large construction program for modern mess halls, BEQs, clubs, exchanges, recreation facilities and family housing — all of which increased the challenges placed on us in the Civil Engineer Corps.

In the seventies and now in the eighties, we are facing even more significant problems and challenges in such areas as retention of our military personnel, environmental matters and the use of energy. Civil Engineer Corps officers must address problems on a daily basis concerning the environment, ecology, pollution control and the need to conserve our precious energy resources. Our job as Navy engineers is more complex than ever. Financial management and greater use and application of computer programs have become a way of life.

In the eighties and beyond, I believe we will be faced with an enormous workload and even less people to handle it than we have today. Certainly the mood of our country has shifted — not only in such areas as military compensation which already has had a positive effect on retention — but the rebuilding of the Navy will carry with it a huge construction and maintenance program which will see even more complex sophisticated systems and controls than we have today.

This all means that more than ever we must continue to achieve and maintain the very highest level of professionalism and continue to find new techniques to *do more with less.*

As I leave the Civil Engineer Corps there is no doubt in my mind that you will find a way to do it in great style.

All the best for the future.

Neal W. Clements

Rear Admiral, CEC, USN
Retiring Commander, Pacific Division, NAVFAC, and Commander, Construction Battalions, Pacific

Qualified engineering students may earn over $830 a month prior to graduation

☐ Students must be a U.S. citizen, between the ages of 19 and 35 years, and within 12 months of graduation and enrolled at an institution accredited by the Accreditation Board for Engineering / Technology . . .

☐ and meeting current scholastic and physical standards upon acceptance into the program, they will be placed on active duty as Officer Candidate, Seaman (E-3), prior to receiving their baccalaureate degrees . . .

☐ upon graduation they will be required to complete Officer Indoctrination School, Newport, R.I., and the basic course of instruction at the Naval School, Civil Engineer Corps Officers, at Port Hueneme, Calif. . . .

☐ following completion of Officer Indoctrination school, and commissioning as Ensigns, Civil Engineers Corps, U.S. Navy, they will be obligated to remain on active duty for four years.

☐ Applicants are not limited to civil engineering but are eligible if completing degrees in *mechanical, electrical, ocean, petroleum, construction, or agricultural engineering*. Applicants enrolled in architecture must be pursuing study programs of at least five years duration in an institution by the National Architectural Accrediting Board.

For further details
Call toll free
Navy Recruiting Command
800-841-8100
or nearest
Civil Engineer Corps
Contact Officers
listed at right

Civil Engineer Corps Contact Officers

☐

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Naval Facialities Engineering Command
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Autovon 224-3636

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Autovon 443-3953

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☐

Construction of *Trident*
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By Naval Sea Systems Command

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